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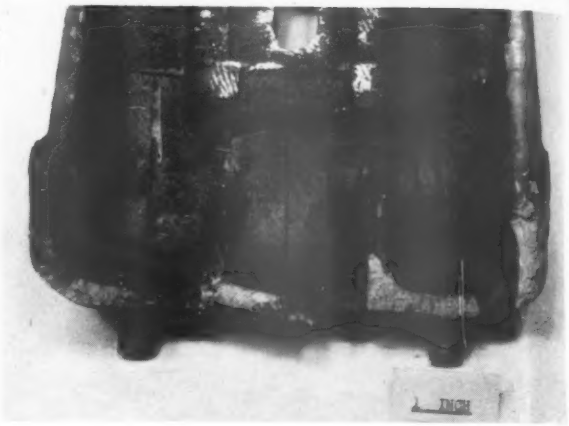

No. 10

Metal Penetration (Rough Surface) in Gunmetal Castings

APPEARANCE

Surface of casting rough.
Looks as though molten metal has filled voids between sand grains without displacing them.

CAUSE

Lack of suitable mould and core dressings.
Coarse grained sand.
Loosely rammed sand.
High pouring temperature.

REMEDY

Avoid excessive pouring temperature and check these points:
Ramming technique.
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Ausschuss durch hartes Gusseisen. Von H. Reininger.
Der Verfasser behandelt jene Einflüsse von Zusammensetzung und Abkühlung, die es bewirken, dass Abgüsse schwer bearbeitbar oder unbearbeitbar werden. Er beschreibt die gefährdeten Stellen—insbesonders Ecken und Kanten—welche am empfindlichsten gegen Weisserstarrung sind und macht eine Reihe von Vorschlägen zur Lösung dieser, für die Praxis so wichtigen Frage. 573

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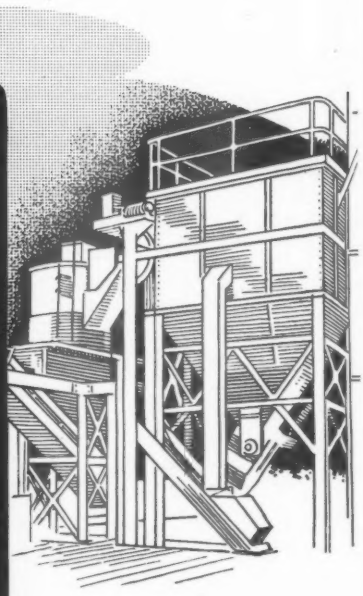
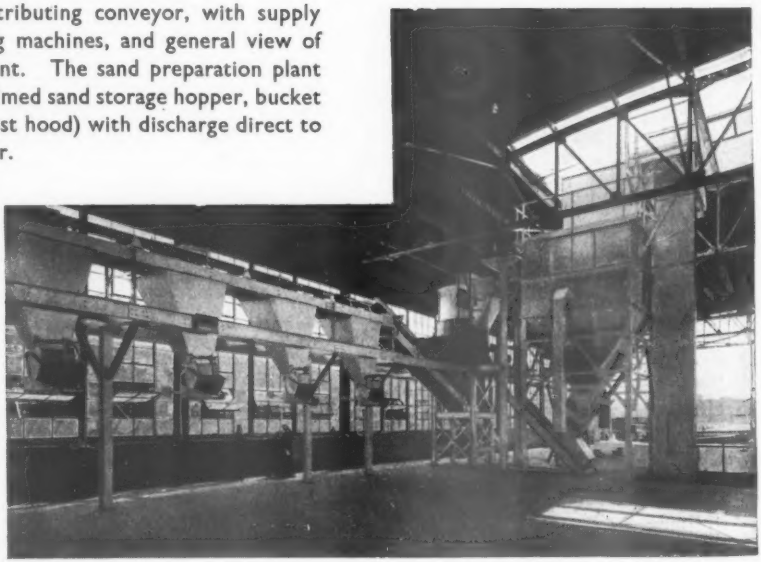


SAND PREPARING & DISTRIBUTING PLANT

Picture shows a distributing conveyor, with supply hoppers to moulding machines, and general view of sand preparation plant. The sand preparation plant includes a large reclaimed sand storage hopper, bucket loader mixer (and dust hood) with discharge direct to distributing conveyor.



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FOUNDRY
TRADE JOURNAL

Vol. 104 MAY 15, 1958 No. 2170

Mechanical Handling

THE Mechanical Handling Exhibition now running at Earls Court, London, *force majeure* has to cater for all industries ranging from the bulk moving of minerals to the assembly of light-engineering components. The foundry lies intermediate between the two, and some of the concerns which have been responsible for the mechanization of large foundries proudly display photographs of their accomplishments.

The outstanding need of the bulk of the foundries throughout the world is the provision of simple plant which will eliminate placing material on the floor, picking it up, taking it somewhere else and replacing it on the floor. The simplest means is by the use of pallets and fork-lift trucks, and over 40 makers of the former and 14 of the latter show their products. A French foundry we visited recently employed this system in the stockyard at a capital cost much below that involved in the erection of cranes and magnets.

We sought to find machines which had foundry applications, and one which applied to us was a mobile platform. A large jobbing foundry having large pits for making castings of varying heights, could, by the use of a platform adjustable as to height, have a better control over the casting speed as the ladle wheel would always be at the optimum level. A French design of monorail used for carrying small ladles for serving mechanized plants, had a new feature inasmuch as the electric cables and attachments were so enclosed as to combine fool-proof adjuncts with freedom from dust and dirt.

A suggestion by a maker of vibratory conveyors was that through their use, castings could not only be transported from one point to another, but in the process could be freed from much of the adhering sand, when carried on a mesh. In another section, the results of intensive research on conveyor belting were being demonstrated. Use is made of a modified Izod machine, because apparently shock is a major cause of deterioration. It was pleasing to note the number of essentially foundry concerns which are making a major contribution to the problems of mechanical handling. Malleable cast chain is very extensively used for the overhead conveyor lines, whilst automatic weighing and measuring, whilst goods are in transit, is done by machinery which is largely an aggregation of castings. A foundry executive visiting the exhibition should find amongst the many exhibits, machinery and notions which will help him to reduce his costs of manufacture. A lesson may be had from examining the stairs, leading to the first floor, constructed from perforated metal strip which is used by research laboratories for rigging up temporary structures. A photograph shows its potentialities, for it depicts a "football" stand erected in Ghana on the occasion of the Royal visit.

ARTHUR E. PEACE

Featuring . . . .

A. E. PEACE

MR. A. E. PEACE is now president of the Institute of British Foundrymen, following his election to high office for 1958/9 at the Institute's annual general meeting yesterday. In business, he is a director of Ley's Foundries & Engineering Company, Limited, and its subsidiaries, Ley's Malleable Castings Company, Limited, and Ewart Chainbelt Company, Limited.

Born and educated at Gloucester, he was first a pupil in the County Analyst's Laboratory, Gloucester, followed by periods as assistant chemist at Petters, Limited, Yeovil, and Brightside Foundry & Engineering Company, Limited, Sheffield. Mr. Peace came to Derby in 1920 as chemist and metallurgist at Ley's two subsidiaries (of which he is now director). During the last war, he acted as adviser to the Ministry of Supply in connection with tank tracks, and also served as an " incident officer " with the Derby Borough Police.

Mr. Peace has made a number of visits to the USA, and the Continent. He is author of many papers and lectures on metallurgy and ironfounding to technical and engineering societies and colleges throughout the country, and a member of various technical committees connected with the foundry and engineering industries, including committees of the British Standards Institution. Until recently, and for a long time, he was chairman of the Research Board and Research Committee of the British Cast Iron Research Association, and chairman of the Technical Council of the Institute of British Foundrymen, of which body he holds the " Oliver Stubbs " and " E. J. Fox " gold medals, and is a past-president of the East Midlands branch.

Mr. Peace is a Liveryman of the Worshipful Company of Founders and Freeman of the City of London. He includes among his leisure interests music, amateur theatricals, golf-club membership as a non-player, and—reluctant—gardening. A speaker of no mean ability, Mr. Peace hides under an easy-going and pleasant manner, a shrewd appreciation of a technical point and a keen wit.

Investment Casters' Conference

The 1958 conference of the European Investment Casters' Association is to be held in Paris from May 18 to 21, and details of the general programme were published in the February 6 issue of the JOURNAL, page 142. The technical sessions will be held at the Cercle Interallie, 33, rue du Faubourg St. Honore, when the following papers will be presented:—

Monday: 9.30 a.m.—Opening of the congress by the chairman and welcome address by J. Pomey (Usines Renault, Paris).

10.0 a.m.—"Aspects of Quality Control of Melting Stock used by Investment Casters," by Mr. G. L. Willan (G. L. Willan, Limited, Sheffield).

11.0 a.m.—Paper by Mr. Waindle, of Detroit, on "Metal Specifications and Practices in USA."

11.30 a.m.—"What is Wrong with Investment Casting," by Mr. J. Aherne-Heron (Trucast, Limited, Bucks).

2.30 p.m.—"Experiences of Precision Casting at the Renault Foundries," by Mr. Marinier.

3.15 p.m.—Films with comments by Mr. Marshall.

4.15 p.m.—Discussion of Association business.

Tuesday: 9.30 a.m.—"Comparison between Cast and Wrought High-speed Tool Steels," by Dr. K. Krekeler (Gebr. Bohler A.G. Düsseldorf).

10.15 a.m.—"Developments of Investment Castings in High-alloyed Steels," by Mr. R. Taylor (Firth Vickers, Sheffield).

11.0 a.m.—"Review of Development of Investment Casting," by Mr. A. Dunlop (Foundry Services, Limited, Birmingham).

11.30 a.m.—"Behaviour of Investment Castings at Low Temperatures," by Mr. V. di Sambuy (Microfusione Italiana, Milan).

2.30 p.m.—"Applying Statistics in Precision Foundries," by Mr. Ballerault (S.F.A.C., Paris).

3.0 p.m.—"Temperature Measurement of Casting Alloys," by Mr. J. Mermillod (Durox-Geneve).

3.30 p.m.—"Some Aspects of Investment Casting Experience," by Mr. L. Walker (Hadfields, Limited, Sheffield).

4.15 p.m.—Presentation of castings made by the delegates themselves, and voting for the "Casting of the Year."

Wednesday: 9.30 a.m.—"Typical Defects in Precision Castings," by Mr. E. G. Nickel (D.E.W., Bochum).

10.15 a.m.—"Influence of Heat-treatment on the Mechanical Properties of a Complex 13 per cent. Chromium Alloy for Investment Castings," by Mr. H. Schneider (Gebr. Sulzer Wintherthur).

11.0 a.m.—Closing session.

Participants are reminded that they are invited to bring to the conference one or more sample, or photographs, of special castings, the production of which has been difficult. An award is to be made for the best casting, but the main purpose of this "contest" is to bring about discussion of production difficulties and to get as many points of view as possible on these problems.

Reorganization Proposals

In connection with this meeting the president, Mr. H. J. Meerkamp van Embden, has circulated a memorandum to attending participants pointing out that the existing "loose" set-up of the European Investment Casters' Association makes it somewhat ineffective when dealing with such bodies as the International Standards Organization, and he therefore asks members to come to the meeting prepared to consider some more-closely-knit organization with a recognized secretariat. The organization of such a body would have to be considered in relation to membership fees, rules for admittance of new members and such-like matters. The president asks that delegates shall come prepared to make known their company's views on these and kindred subjects.

Dinners

IRON AND STEEL INSTITUTE

The annual dinner of the Iron and Steel Institute was held on May 7 at Grosvenor House, London. Mr. C. R. Wheeler, president, was in the chair. Other speakers were Mr. R. Maudling, Paymaster-General, Sir Andrew McCance, president, British Iron and Steel Federation, and Mr. P. van der Rest, president, Belgian Iron and Steel Federation. Members and guests included:—

The German Ambassador, the Luxembourg Ambassador, the High Commissioner for South Africa, the High Commissioner for Australia, the High Commissioner for Rhodesia and Nyasaland, the American Ambassador, the Finnish Ambassador, the Belgian Ambassador, the Spanish Ambassador, the Chief Representative for the European Coal and Steel Community, the Commercial Minister (Canada), the Counsellor (Austrian Embassy), the Commercial Counsellor (French Embassy), the Commercial Attaché (Netherlands Embassy).

Mr. A. H. Ingen-Housz, Mr. C. Schneider, Mr. G. Schjelderup, Mr. F. den Hollander, Mr. C. Jacobsson, Mr. T. Rollman, Dr. H. Dichgans, Mr. L. Charvet, Dr. Bentz van den Berg, Dr. G. Schroeder, Professor A. Lefebvre, Dr. E. Dupuy, Professor P. Bastien. Marshal of the R.A.F., Sir Dermot Boyle, Vice-Admiral Sir Gordon Hubback, Sir Roger Makins, Viscount Falmouth, Sir Owen Wansbrough-Jones, Sir Hugh Beaver, Sir Robert Shone, Sir Godfrey Mitchell, Sir Frederick Pickworth, Sir Charles Lillicrap, Sir Lindor Brown, Sir David Kelly, Sir John Green, Sir Charles Bruce-Gardner, Sir Ernest Lever, Sir Charles Goodeve, Sir Harry Melville, Professor W. Hodge, Mr. K. S. Peacock, Mr. H. Peake, Mr. C. Cobbold, representatives of the steel industries of Britain, Europe, America, South Africa, and Australia, presidents of British and foreign societies, and members of Council.

Correspondence

SOUTH AFRICAN FOUNDRIES

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In the FOUNDRY TRADE JOURNAL, May 1 issue, you published an article on the South African foundries and I thought you might be interested to know that my late father, the founder of C. F. Barker & Sons (Bronze Foundry), Limited, Coventry, worked in the South African Railway foundry at the Salt River Works, Cape Town, until 1888, and made the very first locomotive cylinder ever to be made in Africa.

Prior to this time, they were sent out from this country, and as one was urgently needed he set about making one which turned out quite successfully and thereby saved many months of delay waiting for one to be sent out.

In the winter of 1950-51, I was in Cape Town myself when it was mentioned to the local newspaper and published by them.

Yours, etc.,
E. C. BARKER.

C. F. Barker & Sons (Bronze Foundry), Limited,
Newdigate Road,
Coventry.

Scrap Castings Caused by Hard Spots

*By H. Reininger**

Castings often prove difficult or even impossible to machine, and so have to be scrapped, because of the occurrence in them of hard spots. In the following article the cause and location of these is discussed at length, the danger points in various castings are described and an account is given of the metallographic characteristics of hard cast iron. The Author proceeds to investigate in more detail the cooling and composition factors which influence proportions of ledeburite in the structure of the iron and so produce the phenomenon of local hardness which can have such unfortunate effects for the foundryman.

Characteristics

Hard cast iron which is difficult to machine or in some cases unmachinable, is frequently the reason for rejection. Sometimes hard castings are already withheld by the foundry but hard places cannot always be detected by the usual means of casting inspection. Disregarding castings of less than $\frac{5}{16}$-in. thick which are often hard all over, hard places will be found usually locally on corners and edges, on thin inward ribs beneath thin vents and also in areas quickly quenched by chills. Fig. 1 shows schematically such endangered spots.

Features are high Brinell figures of 250 to 500, increased difficulty in filing, white "chatter marks" in machining and a mottled structure in fractures and macropolished surfaces (Fig. 2(*a*)). Typical of this last-mentioned characteristic are white patches of cementite with grey surroundings adjacent to white cementite-rich concentrations, and grey grains within white nets of cementite in the vicinity of areas low in cementite (Fig. 2(*b*)). The metallographic characteristics of such cast iron are increasing proportions of ledeburite in the structure (Fig. 2(*c*)) until finally an entirely ledeburite eutectic will be found (Fig. 2(*d*)) and the ledeburite formation is the cause of increasing hardness.†

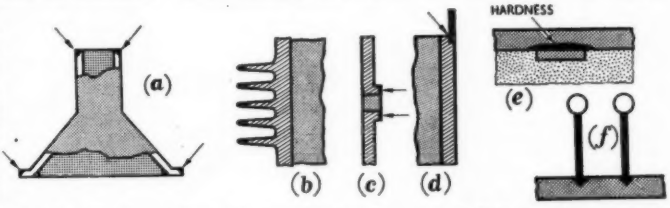


FIG. 1.—*Dark marks indicate edge hardness:—(a) Edges and corners of thin-walled cylinders. (b) Ribbed ends of ribbed cylinders. (c) Stuffing box bores in the water jackets of cylinder blocks. (d) Penetration of white streak caused by core or mould partition joints. (e) Hardness above chill. (f) Hardness underneath thin vents.*

Causes

In most cases the hardness is the combined effect of two factors—an unsuitable iron composition and a rapid rate of cooling. Quick cooling increases and slow cooling diminishes the effect and for this reason thin sections, corners and edges (Fig. 1) are more endangered, because rapid cooling effects stabilization of the carbide and slow cooling in thick sections disintegrates carbide (cementite). This is known as "wall-thickness sensitivity of cast iron."

These considerations are valid only for iron compositions with either very high or very low carbon contents in connection with low silicon contents.

These cast irons with low silicon contents can segregate ledeburitic cementite on cooling. Silicon regulates the structure very effectively as this element decomposes carbide (cementite) under formation of silico-ferrite and graphite more energetically than any other addition to cast iron such as aluminium, copper, nickel and titanium, all of which encourage the formation of ferrite and graphite. It is therefore an old practical rule that the faster the speed of cooling or the thinner the casting sections the higher the silicon content must be in order to prevent white structures or castings with hard edges. In the case of uniformly thin castings it is therefore easy for the foundry to produce castings of $\frac{1}{8}$-in. to $\frac{3}{5}$-in. thickness with silicon contents of 2.5 to 3 per cent. with the higher silicon content for the thinner sections and the lower limit for the thicker sections.

Complications set in when a casting has to be made which contains thin as well as thick sections. In such cases one cannot play safe and work with high Si contents because of the thin sections, since such a composition would produce those "spongy" places in thick sections which are caused by graphite segregation and microporosity, and the castings would leak in these places under gas or liquid pressure. In addition, hardness and tensile strength would be lowered to such an extent that the mechanical properties required would not be obtained on the thicker sections. This often creates a dilemma for the foundry and the silicon content will have to be kept within very narrow limits in order to avoid both hardness on edges and un-

* Abstracted from "Giesserei-Praxis" 75 (1957), No. 18, pp. 389-394, by Dr. O. P. Einerl.

† See also "Notes on the hardness of cast iron," by H. Reininger, *Giesserei-praxis* 74 (1956) 19, 345-52.

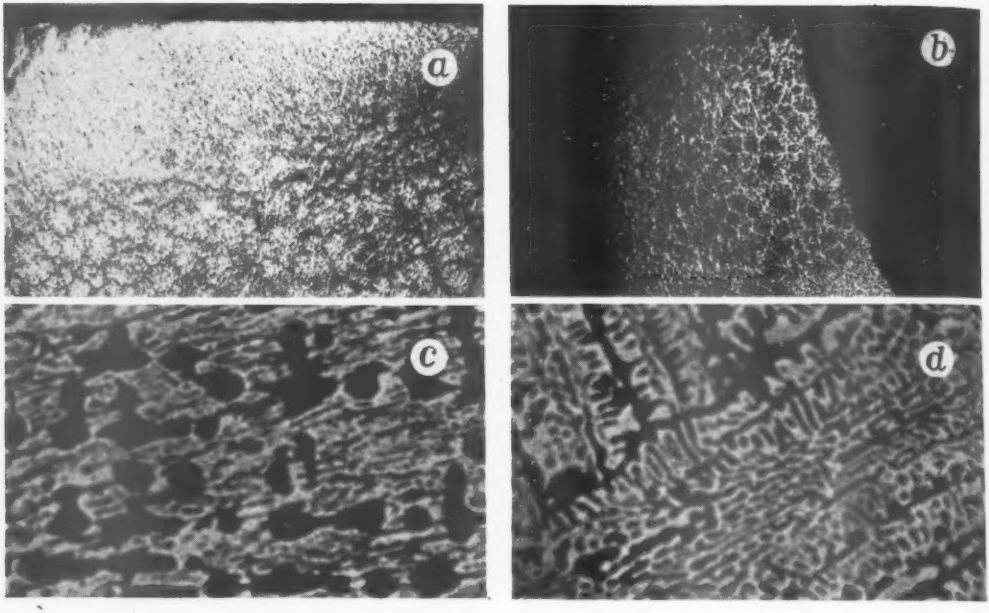


FIG. 2.—(*a*) *Change from white to mottled structure;* ×20. (*b*) *White nets of cementite surrounding grey grains in mottled cast iron;* ×20. (*c*) *Hypoeutectic cast iron with about 3 per cent. combined carbon. The light matrix is ledeburite, the dark areas are primary mixed crystals consisting of iron and cementite. Etched (1 per cent. alcoholic nitric acid);* ×500. (*d*) *Eutectic cast iron with about 4.2 per cent. combined carbon. Exclusively ledeburite eutectic. Etched;* ×500.

soundness in the thicker sections. Every foundry producing motor-car cylinders knows this problem of keeping the silicon content between, say, 1.8 and 2 per cent., because a lowering to 1.7 per cent. Si would produce edge hardness; an increase to 2.2 per cent. Si on the other hand could cause unsound bores of cylinders and valve guides.

Often the incidence of white structures occurs even when the ratio of carbon and silicon contents is correctly chosen and recognizable causes for this cannot—at first—be found. On investigation it will be discovered in many cases that metallic impurities have been imported into the cupola charge with uncontrolled scrap. The most dangerous of such interfering elements is chromium which has the reverse effect of silicon. Whereas silicon decomposes cementite (carbide) most energetically, chromium and also vanadium encourage the cementite formation and carbide stabilization. In borderline cases an additional chromium content of only 0.05 per cent. can be sufficient to induce local edge hardness on spots which are particularly sensitive (see Fig. 1). This can happen when the cast iron has been melted from cementite-containing pig-irons or when charges with high steel addition (30 to 40 per cent.) are melted and used directly. Fig. 3 shows a ribbed cylinder and Fig. 4 (*a*) the microstructure of the edge (taken from the cylinder casting at the point indicated in Fig. 3) when the composition was 3.25 per cent. C, 2.2 per cent. Si, 0.9 per cent. Mn, 0.8 per cent. P and 0.09 per cent. S. No hard spots were found as long as the routine composition was kept close to this, but when 0.2 per. cent. chromium was added, the mottled structure as shown in Fig. 4 (*b*), caused serious edge hardness and the microphotograph shows oblong angular cementite crystals protruding from the fine pearlite and ferrite whereas before (Fig. 4 (*a*)) only large crystals of ferrite could be seen surrounded by fine pearlite. The addition of only 0.2 per cent. Cr. produced a Brinell hardness increase from 226 to 282.

In contrast to the behaviour of normal cementite Fe_3C the chromium carbides are heat-resisting even at high temperatures and they will not decompose even in castings with thick sections which remain hot in the moulds for a long time. The unintentional introduction of chromium mainly takes place when alloyed steel scrap is added to the cupola charge. Such steel scrap may derive from high speed tools, blanking or cutting tools, gear wheels, crankshafts and camshafts. But also scrap cast iron can be dangerous in this respect when it contains castings which were produced for heat-resisting purposes such as fire-bars and retorts. It is therefore always advisable to estimate the chromium content quantitatively when edge hardness or thin-section hard iron occurs and contents

of up to 1 per cent. Cr. may be found on such occasions.

The same influence can also, in principle, be exercised by vanadium which forms very stable carbides—VC and V 4C3—but vanadium is a much rarer impurity in cast iron because it is not used to the same extent as chromium. Casting " hot " tends to reduce edge hardness because it is identical with delayed solidification and " cold " metal solidifies quickly and therefore encourages edge hardness. Hence correct working of the cupola is essential for sensitive castings.

The gating practice too can help or make things worse. Thin sections fairly distant from the ingate can solidify hard, especially when the pouring speed is slow, the mould is slowly filled, and the iron, cooled after a relatively long run, meets the coldest mould surface (Fig. 5). It is quite possible that the same thin sections nearer to the ingate can be perfectly grey. Not only will the mould surfaces near the ingate be heated up to a higher temperature because the whole quantity of iron required to fill the mould will run through here, but these parts will also receive the hottest iron at the end of pouring. The other usual constituents of cast iron such as up to 1 per cent. P, 1 per cent. Mn and 0.1 per cent. S are of negligible influence and do not—contrary to the opinion often expressed—influence the tendency to edge hardening. It has, however, been proved that castings made from old fashioned pig-iron, cast in sand and having ferritic structure with coarse graphite, are less exposed to the danger of edge hardness than castings made from machine-cast pig-iron cast in chills and having very fine graphite in a pearlitic or cementite-containing structure.

The reason for this is probably that cast iron melts made from chill-cast pig-iron contain more nuclei of iron carbide Fe_3C, being decomposition products from pearlite. When these melts solidify such nuclei act again as carbide formers as a first step towards renewed pearlite formation when the casting cools below 720 deg. C. Such an inoculation effect can also be construed as an " inherited " pig-iron property. Experience in many foundries definitely points to the fact that castings previously made from sand-cast pig and containing 2.5 per cent. Si could not be produced so soft and easily machinable when the pig-iron producer changed to chill-cast pigs. There is no doubt that chill-cast pigs constitute a valuable progress for the production of high-grade cast iron with fine graphite and pearlite, but where machinability, low tendency towards edge-hardening and the safe production of thin-section iron castings without the risk of white solidification are more important considerations than high tensile strength and hardness, it is advisable to retain the classic sand-cast pig-iron with coarse ferrite and graphite as part of the cupola charge.

Prevention

The selection and control of the raw material is important. Cementite-free ferritic pig-irons should preferably be used for the production of thin-walled castings susceptible to edge hardening. The total carbon contents should be between 3.2 and 3.4 per cent. C because higher carbon contents of say 3.7 per cent. C encourage the tendency to edge hardness. The silicon content should be kept as high as permissible, this being limited only by the consideration that a very high Si-content might cause a " spongy " structure in thick sections of the same casting. This can be illustrated by the example of cast-iron lorry pistons which have a thin shaft and relatively thick section changes on the base and on the gudgeon pin bearings (Fig. 6).

FIG. 3.—*Ribbed cylinder with 3.25 per cent. C., 2.2 per cent. Si, 0.9 per cent. Mn, 0.8 per cent. P and 0.09 per cent. S, free from Cr. Sample for micros in Fig. 4 were taken from the edge indicated by the shaded pointer on the left.*

If one chooses a high-silicon charge, say with 3.35 per cent. C, 2.3 to 2.4 per cent. Si, 0.8 per cent. Mn, 0.26 per cent. P and 0.1 per cent. S, it is certain that edge hardness in the lower part of the piston shaft will be avoided but, as shown in Fig. 6, sponginess will occur in the corners of the piston base. Such sponginess can be avoided with certainty by reducing the silicon content to no more than 2.2 per cent. Si, but one can no longer be certain that no edge hardening will be found in the thin piston shaft. As, in the case in point, the lorry works were not willing to agree to a design alteration which would have attempted a more uniform thickness all over, it was decided to cast the pistons in a cast iron with 2.7 per cent. Si using an outside chill as shown in Fig. 6. This proved to be a very satisfactory solution and sound castings could be produced in quantities and

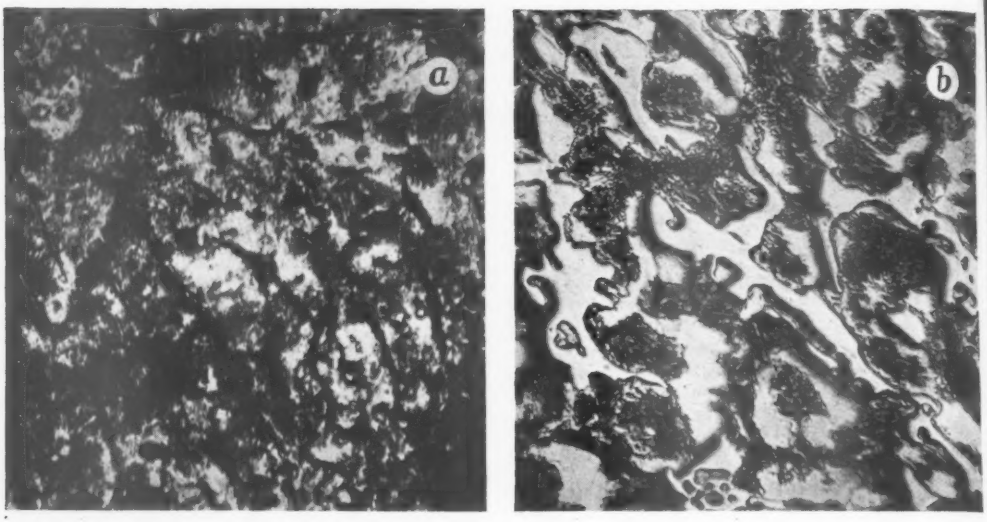


FIG. 4 (*a*).—*Micro from cylinder Fig.* 3. *Structure of edge. Larger ferrite crystals in fine pearlite. Etched. Brinell* 226; ×500. (*b*) *Harde edge producing mottled structure of cylinder shown in Fig.* 3 *after adding* 0.2 *per cent. Cr. Etched. Brinell* 282; ×500.

a typical micrograph taken from a corner of the chilled piston base is shown in Fig. 7(*a*). A very fine-grained ferrite-graphite eutectic can be seen. Larger magnification (Fig. 7(*b*)) of the micro shown in Fig. 7(*a*) reveals a sound, typical soft-iron structure with 164 Brinell hardness, consisting of mainly dendritic ferrite with some ferrite and mixed crystals in the state of decomposition. Fig. 7(*c*) (unetched) shows fine graphite separation in the thick piston base as a characteristic effect of chilling.

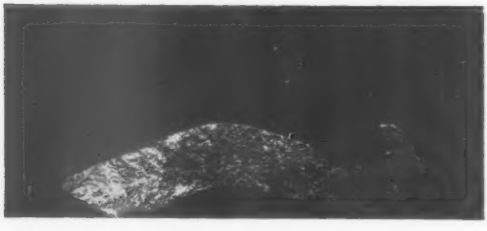


FIG. 5.—*Edge hardness caused by white structure penetration of ledeburite into thin section of casting situated far away from the runner.*

Had the original silicon content of 2.4 per cent. Si been maintained, it would not have been possible to avoid a white structure under the chill (compare Fig. 1 at (*e*)). The very rapid cementite-preserving cooling by the employed chill had therefore to be counteracted by a sufficiently high Si-content. To arrive at a satisfactory solution for continuous production three Si contents had to be tried experimentally (2.2 per cent., 2.4 per cent., 2.7 per cent.) and only the last one led to success. This example demonstrates how sensitive the casting problem may become in the danger zone and results can only be obtained by systematic variations.

Chromium-containing Scrap Steel

Chromium-containing scrap steel and scrap iron should preferably be eliminated by sorting out those parts which can be recognized as alloyed. If this is not possible, the effect of the chromium content can be compensated by nickel additions, which should be three to four times as high as the estimated chromium content. If, therefore, the charge is expected to contain 0.3 per cent. Cr, an addition of 1.0 to 1.2 per cent. Ni is required to balance the chromium. Nickel has a carbide-decomposing action similar to silicon but to a much lower extent. Nickel forms mixed crystals with silico-ferrite and the pearlite hardness increases uniformly as a result.

This fact explains the only moderate reduction in the hardness despite carbide decomposition and elimination of edge hardness. This is because the hard but easily-machinable mixed crystals of silico-ferrite plus nickel appear alongside of the pearlitic cementite in sorbite shape instead of the decomposed carbides. This also explains the metallurgical "equalizing" effect of nickel with regard to the production of uniform hardness and structure in different section thicknesses. Normally, thin walls have the tendency to solidify white when the adjacent, say, ten times thicker, sections are intended to show a pearlitic structure and the silicon content of

the charge has been chosen to achieve this structure. The equalizing effect of nickel causes carbide decomposition in the thin chilled walls, whereas the pearlite in the adjacent thicker sections becomes harder as explained before. The final result is, therefore, the equalization of the structures, or expressed more exactly: The areas of equal structure and equal properties are larger for nickel-containing cast iron than those to be found in the diagram for unalloyed cast iron.

To make successful use of nickel, it is necessary to reduce the silicon content in accordance with the rule that one part silicon has the effect of two parts of nickel. In view of the known relationship between carbon and silicon content, which is expressed by the degree of saturation and the rule of the sums of the contents, it could be surmised that a similar relationship which influences the structure also exists between the carbon and the nickel content. In fact, this can be expressed by a rule that one part of carbon is equivalent to about six parts of nickel.

It is of considerable practical importance that the method of adding silicon has an influence on the greater or lower depth of white structure penetration. It is a known fact that silicon going through the cupola as an alloying constituent of pig-iron, scrap and foundry returns does not prevent edge hardness to the same degree as silicon, introduced into the melt shortly before pouring in suitable grain size and well stirred in, in the form of 90 to 96 per cent. silicon or of calcium-silicon. The latter has a very energetic action in this respect and its calcium content acts at the same time as desulphurizer. Calcium-silicon consists of about 55-60 per cent. Si, 25-28 per cent. Ca, balance iron and carbon.

It is economically advisable to use granulated high-grade silicon simultaneously with calcium-silicon and to make use of the wedge test (Fig. 8) as follows: Suppose that the white structure penetration for a certain type of casting must not exceed

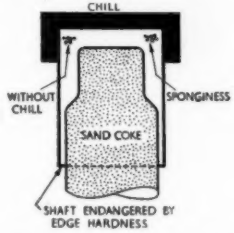
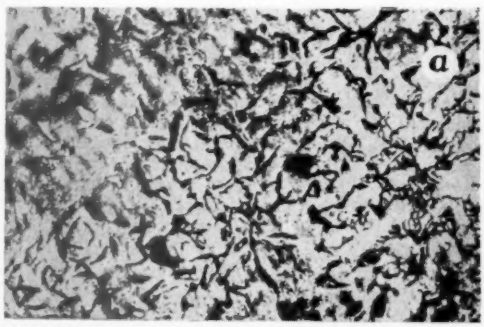
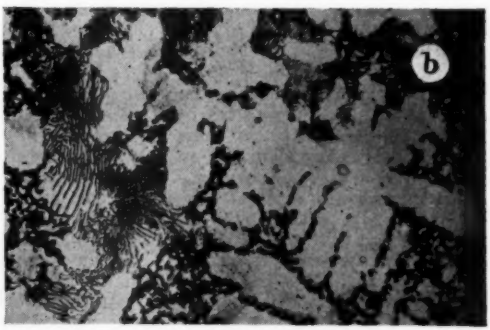


FIG. 6. — *Schematic illustration of cast-iron lorry piston.*

$\frac{1}{4}$ in. but that the charge melt melted in an electric furnace or in a cupola shows a penetration of $\frac{1}{2}$ in. Stirring in 0.2 per cent. granulated silicon will show that the white-structure penetration on sand mould or sand core wedges, as mostly used in foundries, will be reduced to $\frac{3}{8}$ in. As some of the silicon will burn out it is recommended to inoculate with another 0.2 per cent. Si in the form of calcium-silicium to provide a silicon reserve for compensating the silicon loss occurring during the time of transport of the ladles until pouring is completed.

In this way it is possible to use even the last iron





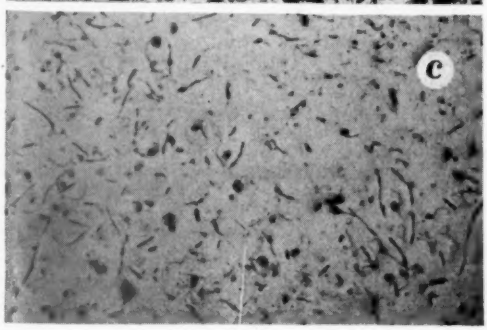


FIG. 7.— (*a*) *Fine grained ferrite-graphite-eutectic in the piston base shown in Fig. 5 after chilling. Taken from edge of corner. Etched;* ×100. (*b*) *Larger magnification of* (*a*), *showing excellent soft structure. Brinell* 164: ×500. (*c*) *Fine graphite in the thick piston base.* (*Effect of chill.*) *Unetched;* ×100.

with a white-structure penetration of about $\frac{1}{4}$ in. for the example as discussed above. It is preferable to make such small adjustments with prepacked ladle additions, rather than by loose, unpacked additions into the ladle or into the spout, because of unknown dust losses in the first case and slag formation in the

FIG. 8.—*Checking the wall thickness sensitivity by observing the white structure penetration in test wedges. Underneath can be seen the ladle additions ready for immediate use.*

spout in the second, and moreover to avoid mistakes by weighing up quickly.

Moulding Precautions

White-structure penetration can also be counteracted from the moulding side. The formation of fins at endangered places must be prevented by filling-in the parting joints and assembly gaps. When casting cylinders, where danger is to be expected, it is recommended to replace an inevitable thin fin (as shown in Fig. 9 at (*a*)) by a deliberately-added wedge-shaped rib (as shown in Fig. 9 at (*b*)) extending over the whole length of the cylinder block, and this added rib will solidify with certainty as grey iron. White-structure penetration can also be avoided underneath thin air vents (as shown in Fig. 1 at (*f*)) by thicker vents or by omitting these altogether at endangered places. It is also necessary to ensure that cores are correctly placed, otherwise one side of the wall may become too thin and may solidify hard.

Shifting of runners to another position can also achieve improvements and ingates should always be placed in such a way that thin-walled endangered casting areas will be heated up by the iron flowing over them. The edge hardness shown in Fig. 5 could therefore be avoided by running the iron in at this place. Very often small pattern or corebox alterations are sufficient to provide a quick remedy, a little more machining allowance, $\frac{1}{16}$-in. more wall thickness, reinforcing of ribs and webs, reducing the diameter of cast-in bores, or casting hubs and eyes solid, rounding up of sharp corners and edges, etc., may eliminate any danger.

Summary

Summarizing the procedure to be adopted when edges solidify white, the following recommendations can be made: (1) Check the carbon and silicon content of the iron, adjust the composition when necessary, making use of the wedge test all the time. (2) Use more suitable pig-irons free from cementite and having higher Si contents. Reduce steel-scrap additions. (3) Examine the possible presence of chromium and vanadium. Eliminate chromium containing materials from the cupola charge or compensate the chromium present by correct nickel additions. (4) Remove or reinforce fins and air vents. Replace thick chaplets (which act as "cooling nails" and promote cementite formation) by thin chaplets which weld themselves into the metal whereas thick chaplets remain unmelted. (5) Alter the running system so that endangered thin-walled areas will be heated up by liquid iron flowing over this area for a longer time so that it will be filled by the last hot iron. Alternatively, pour through this area in order to heat up and to bring hot iron along. (6) If edge hardness is caused by "cold" iron, cast at higher temperature. (7) Alter patterns and coreboxes so as to create reinforcements in the meaning of larger material accumulations.

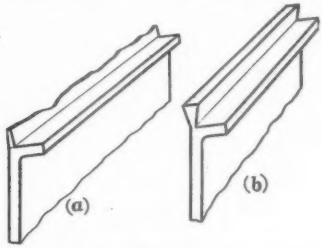


FIG. 9.—*Showing fin causing white structure penetration (at (a)) and prevention by a cast-on wedge-shaped rib (at (b)).*

Selling in World Markets

The opening session of the Production Conference, which is to run concurrently with the Production Exhibition at Olympia this month, took the form of a discussion forum on "Selling in World Markets," held on May 13 under the chairmanship of Major-General K. C. Appleyard, C.B.E., past-president of the Institution of Production Engineers.

On the platform were: Sir John Taylor, K.B.E., C.M.G., director-general, Hispano and Luso-Brazilian Councils (representing the Federation of British Industries); Mr. William Hughes, C.B., Under-Secretary, Commodity and General Division of the Board of Trade; Dr. E. H. Hague, M.SC., head of purchasing department, Shell-Mex and B.P., Limited. ("The Buyer"), and Mr. Thomas Whitaker, joint managing director, Smith & Nephew, Limited, Welwyn Garden City. ("The Salesman").

Recovery of High-grade Iron Ore at Copper Cliff, Ontario

By Paul Queneau, E. H. Bracken and D. Kelly

By applying an ingenious recovery system to their waste minerals Canadian nickel-mining concerns to-day contribute about 890,000 *long tons of iron ore per annum to the North American supply. The significance of such a high recovery figure is self-evident and in what follows the progress of the system which has been applied with such success is described in some detail, from the pilot scheme to the full-scale operation as it is now functioning.*

Introduction

The deposits worked by the International Nickel Company of Canada, Limited, in the Sudbury District of Ontario consist essentially of sulphide and rock minerals. Until recent years the metallic sulphide minerals were recovered by flotation in a mixed nickel concentrate and a copper concentrate. Since the iron : nickel ratio of the nickel concentrate was approximately 10 : 1, the controlling factor in nickel-smelting capacity was the large quantity of iron to be slagged. Studies on treatment of the concentrate for iron recovery indicated that this could be achieved on a satisfactory basis through procedures by which (*a*) the nickel content of the concentrate could be reduced to below 1.0 per cent. with the virtual elimination of copper, precious metals and silicate contaminations, (*b*) the sulphur content of the concentrate could be reduced to below 1.0 per cent. and (*c*) the nickel content of the final iron-oxide could be reduced to 0.15 per cent. or less.

A £7,080,000 plant for separate treatment of 324,850 long tons per year of pyrrhotite by the new process was constructed near Copper Cliff, Ontario, and its operation started early in 1956. It is the first unit of an installation which will have a capacity of more than 890,000 long tons per year of pyrrhotite.

Sulphur elimination is accomplished in fluid bed roasters operating in closed circuit with cooling boilers and cyclones. Nickel is extracted by atmospheric pressure leaching in ammoniacal solutions following selective reduction of the calcine in kilns using concurrent gas-solids flow. Permanent magnet equipment is used for solid-liquid separation in the leaching operation and steam kettles are employed for nickel precipitation from pregnant solution. The magnetite fines are agglomerated into one-inch balls by pelletizing on discs and firing on a travelling grate. Over 200,000 long tons of 68 per cent. Fe, pellets containing P 0.003 per cent., SiO_2 1.5 per cent., S 0.01 per cent., Ni 0.15 per cent., have been produced to date.

A pyrrhotite concentrate is produced by a sequence of beneficiation operations which include grinding, flotation, magnetic separation, regrinding and reflotation. The resulting product contains :— Cu 0.05 per cent., Ni 0.75 per cent., Fe 57 per cent., S 37 per cent., SiO_2 2.5 per cent., and is about 90 per cent. through 200 mesh. The concentrate is pumped as a 20 per cent. solids pulp through wood-stave pipes four miles to the iron-ore recovery plant. Here it is received and de-watered to 75 per cent. solids.

Roasting

Roasting is the first major unit operation in the conversion of finely-divided, nickel and sulphur-bearing iron ore into lump, low-nickel, sulphur-free iron ore. Roasting is carried out at about 778 deg. C. and oxygen supply is so controlled that a small amount of magnetite is produced in a ratio of about 1 mag. : 10 hem. Roasting is carried out in two roasters of 489 tons per day capacity.

The roaster is a refractory-lined, cylindrical steel shell, 43 ft. in height from hearth to roof brick, with i.d. 22 ft. to 26 ft. The Lurgi grate is made up of mild-steel bars bolted tightly together with tapered slots between them for air flow. The grate weighs 17.5 long tons and is securely held to a metal framework supported by the cone-shaped windbox. The open area of the grate is approximately 0.5 per cent.

Relatively coarse 65-mesh to 20-mesh particles, provided by natural occurrence in the pyrrhotite feed, maintain a bed on the grate to a depth of 3 ft. when in repose. Twelve hours of heating are required to bring roaster temperature up to about 704 deg. C. The required air blast is then applied and the temperature rises to about 778 deg. C. throughout the shaft. Gas leaving the roaster is deprived of well over 90 per cent. of its dust which is fed by gravity directly to the kiln below. Precipitator dust is also fed to the reduction kiln.

Reduction

Each of the fluid bed roaster systems is in gravity-feed relationship to a rotary kiln. The function of the reduction operation is to convert the oxide compounds of nickel in kiln feed to the ammonia-soluble metallic state. The first reduction stage of the kiln operation is at relatively high temperature, 871-899 deg. C., and in a strongly reducing atmosphere. Most of the oxide nickel is converted to

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* The original paper of which the above is an abstract was presented at the 1958 annual meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers in New York last February. The authors are all associated with The International Nickel Company of Canada, Limited, Mr. Queneau being the assisant vice-president of the company, Mr. Bracken superintendent of the iron-ore recovery plant at Copper Cliff and Mr. Kelly the plant's assistant superintendent.

Recovery of Iron Ore

a nickel-iron alloy and the remainder comes in the iron oxides. The final reduction stage of the kiln operation is at relatively low temperature, 649-704 deg. C.

The kiln is 185 ft. long and has a 13 ft. dia. inside the steel shell. This is probably the largest gaseous reduction kiln in the world. Roaster calcine enters the kiln at 538 deg. C. and is rapidly raised to a temperature of 871 deg. C. by an oil flame. Indicated oil-consumption amounts to 3,000,000 b.t.u. per long ton of iron-ore pellets.

The kiln coolers discharge the calcine, now essentially magnetite with a little ferro-nickel and nickel-iron sulphide, at 204 deg. C. directly into one of the two agitated water quench tanks provided each kiln. The magnetite pulp is pumped at 30 per cent. solids to the leaching building.

Leaching

Reduced calcine from the kilns is leached at atmospheric pressure in aerated ammoniacal ammonium carbonate for extraction of its metal content. This involves six stages of leaching including a grinding operation and five stages of washing. Solid-liquid separation is accomplished magnetically by permanent-magnet machines. Dissolved nickel, copper and cobalt are separately recovered. The leached and washed magnetite is pumped to the pellet building for agglomeration.

Agglomeration

Leached magnetite is received in the pellet building and agglomerated into hard, one-inch balls by baking on a travelling grate. This involves dewatering the magnetite, the formation of wet "green" pellets on balling discs and drying, together with the preheating, firing and cooling the pellets on a modified sintering machine.

Summary

A combination of roasting, reduction, leaching and agglomeration operations produces iron-ore pellets of the following composition: Fe 68 per cent., P 0.003 per cent., SiO_2 1.5 per cent, Mn 0.05 per cent., Al_2O_3 0.65 per cent., CaO 0.25 per cent., MgO 0.30 per cent., S 0.01 per cent., Cr_2O_3 0.05 per cent., TiO_2 0.15 per cent., Ni 0.15 per cent., Cu 0.01 per cent. This product of the recovery system described has been used very successfully in both Canada and the United States and is believed to be the highest-quality iron ore produced in quantity in North America.

BIRLEC, LIMITED, of Birmingham, has formed a branch organization in Canada to supply furnaces and other equipment to the growing engineering and metallurgical industries in that country. In charge of the new venture will be Mr. B. Evans, a metallurgist from the Birlec melting furnace division, who will set up his base in Toronto this month. The company has already supplied a number of furnaces to Canada in the past few years, and large extensions to production capacity will be able to be made in a new factory on a 34-acre site at Aldridge.

Confidence in Steel's Future

Steel was becoming more and more the basis of the national economy, said Mr. Reginald Maudling, the Paymaster-General, in London last week. At the moment production was limited by the demand, and for the first time since the war the volume of orders from consumers was below the industry's capacity to produce, but it had a great future still ahead of it.

Mr. Maudling was speaking at the annual dinner of the Iron and Steel Institute (referred to on p. 572), at which there was a highest-ever attendance of 1,500. The industry's record over the last 10 years was truly remarkable, he said. Production and productivity had been greatly expanded, labour relations had been excellent, and prices were such that British steel could compete anywhere in the western world.

Speaking of the proposed European Free Trade Area, Mr. Maudling said that this was of immense importance to the iron and steel trade, which had a special interest in it.

Mr. C. R. Wheeler, president of the Iron and Steel Institute, said that he was a great supporter of the British concept of a Free Trade Area and was glad that the steel industry as a whole had indicated its support of the project. Far from having anything to fear, they had a chance to share in a much bigger market. He expressed confidence in the future of the steel industry. The use of steel might decline in certain spheres as newer materials developed, but it would continue to be the basic raw material of industry. Demand was smaller at the moment, but he hoped and believed that with the play of free enterprise by the end of the year the industry would have recovered the lost ground.

It was announced at the annual general meeting on May 7 that H.M. King Baudouin, King of the Belgians, and H.R.H. Charlotte, Grand Duchess of Luxembourg, had graciously accepted honorary membership of the Iron and Steel Institute. They are joint patrons of the Institute's special meeting in Belgium and Luxembourg, which is being held from June 18 to 28, in conjunction with the *Journées Internationales de Siderurgie*, being organized in connection with the Brussels World Exhibition.

Iron-ore Imports

Iron-ore imports in March, and the totals for the first three months of this year and last, are shown below.

From	Month ended March 31.	Three months ended March 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Sierra Leone	62,450	147,114	194,980
Canada	—	122,791	119,027
Other Commonwealth countries and Eire	—	5,026	—
Sweden	309,117	836,629	945,359
Norway	19,167	49,873	54,735
France	42,417	156,440	144,825
Portugal	8,633	28,355	36,944
Spain	43,127	238,948	165,949
Algeria	141,403	383,006	399,378
French West Africa	60,506	167,342	153,934
Tunisia	71,100	184,328	213,230
Northern Morocco	24,870	43,617	42,320
Southern Morocco	39,400	60,640	106,309
Liberia	39,180	101,639	86,570
Venezuela	94,293	320,810	455,780
Brazil	80,300	134,209	167,007
Other foreign countries	19,550	7,836	57,301
TOTAL	1,055,513	2,988,603	3,343,648

National Society of Master Patternmakers

President's Report for 1957

The third annual general meeting of the National Society of Master Patternmakers was held on May 3 at the offices of the FOUNDRY TRADE JOURNAL, Mr. N. Gott presiding. After disposing of a quantity of formal business, Mr. Gott submitted the following report, in the course of which he said:—

During the past 12 months there has been a steady increase in the activities of the Society and, perhaps just as important, in its prestige. At the beginning of the session, the Council decided that, as in previous years, a series of works visits should be arranged, but with a considerable difference in scope. This difference was, that the visits should be of such a nature that they would be interesting to members and yet should strike new fields of appreciation, as distinct from patternmaking. To this end the programme drawn up in this connection ranged from shipbuilding to artificial silk, from textile manufacture to the manufacture of steel strip. With these, the open forum in London, and the official visit to the Marine and Welding Exhibition last September, such activities merited the word "diversified."

The members had continued their activities on the various committees to which they had been directed and in particular it may be noted that at long last the Timber Trade Development Association were beginning to appreciate the importance of providing timbers of equivalent stability to those used by Continental manufacturers. The president said that thanks in particular were due to the Society representative, Mr. Stansby, for his efforts and attendances at these committees.

Publicity

During the year, members had received several *Bulletins* giving details of the Society's activities, and arrangements have been made for more continuous publicity through the medium of the FOUNDRY TRADE JOURNAL.

Thanks were due once again to the Editor and directors of the JOURNAL, for their good offices and the facilities which they so willingly placed at their disposal. Throughout the year contact had been maintained with the French Patternmakers' Society and had also been established with the controlling body of the German Patternmaking Society.

It was hoped, in the early stages, that a joint visit with the French Society might be made to the German patternshops; this, however, had not proved to be possible, but by the hard work of the Council and the activities of Mr. Scott and Mr. Faulkner, in particular, a visit had been arranged to the West German patternshops in June. No doubt there would be a return visit from them, perhaps later in 1958 or maybe in 1959.

During the year the Society had had several communications from abroad, covering such subjects as trainee employment, apprentice competitions and the like. This undoubtedly pointed to the extending influence of the Society. A communication has also been received from a certain Government Department requesting the help of the Society on certain basic phases of pattern manufacture, and this at the moment was still being studied.

Membership and Finance

The membership of the Society continued to increase; 12 months ago membership was 77 and it was now 83. It should be noted that this increase in members was in no small measure due to the activities of the regional branches; in fact, if all the branches provided the same standard of entertainment as that provided by the North Eastern section, he was sure that the Society would be inundated with applications for membership. The financial

In the accompanying illustration Mr. N. Gott (right) of Hargreaves & Gott, Limited, president of the National Society of Master Patternmakers, is shown accompanied by Mrs. Gott receiving members and guests at the Society's annual banquet held in the Strand Palace Hotel, London, on May 2. Shaking hands with the president is Mr. W. Hartley, of Hartley & Sugden, Limited, with Mrs. Hartley on his right.

National Society of Master Patternmakers

position of the Society continued to gain in strength and it was now, without doubt, on a very sound financial footing, and, providing membership showed a steady increase, and good house-keeping was applied, in particular to financial activities, there was no reason why in due course the Society should not offer to its members services second to none.

Sincere thanks were due to the immediate past-president, Mr. Brown, for his help in the past year, to the vice-president, Mr. Scott, for his efforts both on the German visit and in the arrangements for the dinner held on May 2 (see previous page and last week's JOURNAL, page 538) and to all members of the Council and the secretaries for their help and unstinting support during the past year.

Election of Officers

The election of officers then took place which resulted in Mr. R. Scott being elected president and Mr. W. Hartley vice-president for the ensuing year.

Mr. V. C. Faulkner, honorary member, expressed the gratitude of the members to Mr. Gott for the work he had done for the Society during his year of office. As the founder of the Society, it was obviously a real pleasure to him to see the progress that had been made in so short a time. He hoped that the Society would have the benefit of Mr. Gott's advice for many years to come. This was warmly accorded. Finally, the work of the secretaries was highly commended in a vote of thanks.

Industrial Production—Slight Decline

Provisional estimate of industrial production for March gives an index figure of 144-145 (1948=100), compared with 145 for March, 1957. Later information has enabled the provisional figures for January and February to be revised upward a point or two and the average for the first quarter of the year is 142, the same as last year. As last year's March index was affected by the engineering and shipbuilding strikes, the trend would appear to be slightly downwards.

Detailed figures available up to February show that manufacturing industry has maintained total production at the level of a year earlier, but a sharp fall occurred in the output of the "mining and quarrying" group, where the average for the December-February period dropped from 115 to 111. Average output of the "gas, electricity, and water" group rose from 183 to 196.

Detailed figures of national earning and spending for the fourth quarter of 1957 show that in "real terms," the nation produced nearly 1.5 per cent. more goods and services, and the amount devoted to gross fixed investments—maintaining and extending factories, equipment, houses, and other capital wealth—was 5 per cent. greater than in the corresponding period of 1956.

THE Birtley Engineering Company, Limited, Birtley (Co. Durham), has received a contract for the construction of coal-handling plant at the Willington "B" power station for the Central Electricity Generating Board.

Alkali Act

Chief Inspector's Annual Report

Concentration of manufacturing operations has led to the reduction in the number of works registered under the Alkali Act, but there is no lessening in activity or lower production, states the Chief Alkali Inspector for England and Wales in his annual report. Number of works (872) involving separate processes (1,733) showed a decrease of 17 and 14 respectively. Of the total of 4,023 visits and inspections, 55 were to colliery spoilbanks.

Complaints were most numerous against cement works (11) and fertilizer granulation plants (9), and among non-registered works, carbonization plants (gas-works and coke ovens, 7) headed the list. The reduction in the number of infractions (23 in 1956 and 48 in 1955) shows a continued improvement in supervision and maintenance.

Last year the inspectorate became responsible for dealing with smoke, grit, and dust from registered operations and a general survey revealed that in many cases conditions were already satisfactory. Use of gas, oil, or coke fuel, or mechanical stoking would solve the problems of the remainder. Reduction of pollution is not regarded as an essentially formidable task—"nothing like that which some of the processes which may be registered in the future will present." An indication of the "shape of things to come" is given by the Chief Inspector for Scotland, who mentions the time which has had to be devoted to work on the safe disposal of radioactive wastes.

At 2,137,000 tons, sulphuric acid production again showed a rise (2,056,000 tons in 1956 and 821,000 tons in 1938), although the number of works registered is less than before the war. There has been continuing installation of means to prevent emission of acid droplets and such future emissions "will rightly be regarded most seriously." The operation of plants for concentration of sulphuric acid has in general been reasonably satisfactory.

F. Perkins's Group Report

For 1957 the turnover of F. Perkins, Limited, diesel engine manufacturers, of Peterborough (Northants), dropped by £7,000,000 to some £14,000,000, and the group incurred a loss, before tax, of £327,478, compared with a profit of £768,934 for 1956. This is the first loss the company has made for over 20 years. There is no dividend for the year, compared with 10 per cent., on the £2,600,000 one-class capital. These setbacks, it is stated, were due to loss of vehicle engine orders and delay in starting delivery of certain substantial new contracts, through no fault of the company. The Suez crisis and the closure of the most important Eastern market due to internal financial restrictions were also to blame.

Substantially reduced overheads were not brought down in line with turnover because of the new design development programme and production increase forecast for this year, but new contracts are now proceeding well, it is stated.

At a Press conference last week, Mr. Frank Perkins, the chairman, said that his company had been so successful with its engines that large vehicle makers were now producing their own diesels; this had been foreseen by the board and new products were planned. He added that the business was now running again at a profit.

Notes from the Branches

Wales and Monmouth

The annual dinner/dance of the Wales and Monmouth branch of the Institute of British Foundrymen was held at the Royal Hotel, Cardiff, in March, when 150 members and guests attended. The branch president, Mr. D. C. Gaze, presided, and among the guests were Mr. J. Blakiston, national president, Mr. Peace, Mr. G. Lambert, national secretary, and Mr. Vickery, vice-president of the Bristol and West of England branch, most of whom were accompanied by their ladies. The toast of "The Institute" was proposed by Mr. Gaze and replied to by Mr. J. Blakiston, who referred to the rather large assembly as being an indication of the virility of the branch. He concluded by saying that he looked forward to the continued progress of the work of the Institute in the principality. A touch of humour was introduced into the proceedings by Mr. G. Lambert who replied to the toast of the ladies and guests. The remainder of the evening was taken up with dancing which continued until 1 a.m. with Mr. Duddridge again very ably undertaking the duties of M.C.

Annual Meeting

The annual meeting of the branch was held in Newport on March 29, with Mr. D. C. Gaze in the chair. Business commenced with the approval of the minutes of the last meeting and this was followed by the election of officers for the coming year as follow:—Mr. L. Duddridge as president; Mr. R. S. Turner as senior vice-president; Mr. T. E. Rowlands, Mr. J. V. Faulkner, and Mr. J. A. F. Jarvis, members of the branch Council; Mr. Austin Bevan, Technical Council representative, and Mr. A. S. Wall, hon. secretary.

Mr. Gaze then briefly reviewed the work of the past session, and commented that although both lectures and works visits had been well attended there was still room for improvement. He was very pleased that two diplomas were to be awarded to branch members at the national conference, and he hoped that this would encourage other members to contribute papers to the technical programme. He concluded by thanking members of the branch Council and the hon. secretary for their assistance and co-operation during his year of office—it had been a very interesting and happy experience. Finally, he wished Mr. Duddridge every success in the coming year.

Production Problems

Following the annual meeting, Mr. J. G. Bailes presented a paper on "Production Problems in a Steel Foundry," and illustrated this with a series of lantern slides. It was a most interesting discourse, which covered every detail of the subject from the choice of moulding sands to the finished casting. Throughout the talk the salient point was quality. A lively discussion followed presentation of the paper during which Mr. Bailes very ably dealt with questions, and maintained the attention of the meeting.

Moving the vote of thanks, Mr. Cannard said it was a pleasure to have heard such a forthright approach to foundry problems. Mr. Bailes had confirmed what many founders realized and that was that high-class castings required meticulous care in production. Mr. Croxford, who seconded the proposal, endorsed Mr. Cannard's remarks.

Works Visit

On February 22, members visited the works of the Saunders Valve Company, Limited, at Cwmbran, Mon. On arrival they were welcomed by Mr. T. E. Rowlands, works manager, and a team of guides, each of whom took charge of a dozen visitors. The tour of the works included the patternshop, foundry, heat-treatment department, and the machine and assembly shops. A display of rubber-lined valves especially attracted the attention of members as did also the rubber-processing department.

After tea, which was generously provided by the firm, the party was addressed by Mr. W. B. Trenholme on the subject of "Work-study in the Foundry." His presentation of this abstract subject was most interesting and throughout he had an attentive audience. In the discussion which followed the number of questions put to him by members proved how controversial this approach to efficient production can be. To his credit, however, Mr. Trenholme replied to each and every query satisfactorily.

In moving the vote of thanks Mr. Duddridge said he felt sure he had the approval of all present in thanking Mr. Trenholme for a very interesting lecture on a subject with which few foundrymen were familiar. He himself had acquired much useful information from the lecture. He also expressed the thanks of members to the directors of the Saunders Valve Company for their generous hospitality, and to the guides for their courtesy and helpfulness during the afternoon. He added that the attendance of approximately 80 members indicated the appreciation they felt for the invitation to visit the factory.

Mr. Howard Williams, seconding, said that he had had some experience of introducing work-study methods and he was pleased to add his thanks to the lecturer. He wished also to associate himself with the expression of thanks to the firm. Replying, Mr. Trenholme said that it was his first visit to South Wales and he had enjoyed the experience; the interest shown by members had been ample reward for his effort. On behalf of the firm, Mr. A. L. Trump said they were gratified to see so many present, the company was always happy to welcome members from the Institute and he hoped they had derived as much pleasure from the meeting as he had.

Lancashire

The annual general meeting of the Lancashire branch was held on April 26 at the Midland Hotel, Manchester, under the chairmanship of Mr. E. H. Beech, branch president. The secretary, in his report, briefly reviewed the activities of the branch during the past session, and in giving a resumé of papers presented said that the best attended lecture of the session was that at which Mr. D. H. Scott had shown his colour film entitled "Mechanical Aids to Shell Moulding." An unusual type of paper for the branch had been "Iron and Steel Foundries Regulations," presented by Mr. E. Waller, H.M. Deputy Superintending Inspector of Factories (East Lancashire Division). He made special reference to the good progress of the Stoke-on-Trent section, and congratulated those concerned with the arrangements for the annual dinner/dance of the Lancashire branch, which had been so successful. He reported that membership of the branch was still increasing and now numbers well over 700. During the past session four new members had been admitted, 20 associate members and 8 associates.

Following the presentation of the secretary's report, a vote of thanks to the retiring officers was proposed by Mr. C. M. G. Wallwork, and Mr. Walker seconded the proposal.

Mr. Beech reciprocated his thanks to members for their support during his term of office, and in thanking the branch Council for their "counsel" he especially

Notes from the Branches

mentioned Mr. F. Nield who had done so much to help him. He expressed the hope that many younger members of the branch would seek office. He then invested Mr. H. Booth, the new president, with his chain of office and wished him all success. Mr. Booth suitably replied.

Election of Officers

The officers for the coming year were then elected as follow: Mr. C. M. G. Wallwork (Henry Wallwork & Company, Limited), as senior vice-president; Mr. F Nield, as junior vice-president; Mr. Swinglehurst, Mr. Smethurst and Mr. Higinbotham as members of the branch Council (three years); and Mr. E. H. Beech, Mr. H. Haynes, Mr. E. Jackson and Mr. W. E. Spenceley as delegates to the General Council. Mr. F. Nield is again secretary and Mr. F. Harper, treasurer. In view of the fact that Mr. Nield is both vice-president and secretary the Council were given powers to co-opt an assistant branch secretary.

John Wilkinson Competition

The papers entered for the John Wilkinson medal competition this year, were of high standard and equalled those presented in previous years. Mr. Wallwork, organizer of the competition, was congratulated by Mr. Beech for the efficient way in which he had made all the necessary arrangements. The adjudicators, Mr. E. Jackson, Mr. A. Kirkham and Mr. G. Walker were also thanked for their help and co-operation. Of the 23 entrants, the first prize winner was Mr. Michael Gartland (Fig. 1), of the Distington Engineering Company, Limited, with his paper entitled "Loam Moulding a Casting for the Chemical Industry," for which he received the medal and a prize of £8 8s. 0d.

FIG. 1.—*Mr. Michael Gartland receiving the John Wilkinson medal from the branch president, Mr. E. H. Beech.*

The second prize-winner was Mr. A. M. Croft (Leyland Motors, Limited) and third, Mr. T. Dooley (Whitehead & Poole, Limited) who were the recipients of £8 8s. 0d. and £6 6s. 0d. respectively. Those highly commended were Mr. T. Cowley and Mr. J. Telford (both apprentices of the Distington Engineering Company) and Mr. E. Holland and Mr. C. Smith (apprentices at the Henry Wallwork Company).

The announcement was then made of a competition proposed by Mr. Longden, who had offered a series of awards to those who submitted to the branch the best essays and papers on foundry practice. In giving brief details Mr. Longden said the essays, of not more than 500 words, would be appraised by not less than three members of the Council: selected essays were to be made available for publication. Further details would be circulated later.

The meeting was concluded by the showing of a sound and colour film entitled "Flow of Metal into Moulds"—made by the IBF technical sub-committee.

Northampton and District Section

The March meeting of the Northampton and district section constituted a visit to the Peterborough Works of Baker Perkins, Limited, on the 15th of the month. Thirty members and visitors attended this visit which took the form of a tour of the machine, plating, and erecting shops, the foundry and the patternshop, lasting for 2½ hours in all.

The company is well known for its manufacture of dough-mixing and bakery machinery, and several of these machines, inspected in the erecting shop, proved to be extremely interesting to members. Diesinking to form biscuit moulds was a very intricate operation which was greatly admired, as also was the very clean and tidy nature of the various shops and stores, all of which were provided with very good natural light. The foundry was somewhat smaller than expected but was well equipped with two sandslingers, two electric furnaces and two crucible furnaces as well as two cupolas. The production of castings in iron, steel, aluminium and gunmetal is said to be carried on at a rate of 60 tons per week.

Stoke-on-Trent Section

The last works-visit of the current session of the Stoke-on-Trent section took place on March 29, when a party of 50 members and guests visited the shipyard of Cammell Laird & Company (Shipbuilders & Engineers), Limited, Birkenhead. The visitors, who were met by a party of guides provided by the company, were conducted through the joiners' and woodwork-furnishing shops and the pattern, machine and engine shops, and the visit concluded with an inspection of the vessels being constructed on the slipways, and of the fitting-out basins.

During luncheon, taken at the Central Hotel, Birkenhead, the section president, Mr. R. Lewis, proposed a vote of thanks to the directors of the company for making the visit possible, and also expressed appreciation to the guides, Mr. P. Sherida, Mr. P. Spender and Mr. T. Jones, for the way in which they had helped to make the visit so interesting and enjoyable.

Australia (Victoria)

The March meeting of the Australian (Victoria) branch, held under the presidency of Mr. G. D. Thompson, saw films of "The Japanese Iron and Steel Industry"; "Gas from Gippsland" (production of gas from brown coal); and "Aluminium from Bell Bay, Tasmania."

An Eighteenth Century Iron Foundry

By T. R. Harris

The invention of the separate condenser by James Watt led to an increased number of steam engines being required on the mines of Cornwall in the latter decades of the eighteenth century. The castings for these were invariably obtained from John Wilkinson, ironfounder of Bersham. Delay in delivery was often experienced because of contrary winds which detained the vessels chartered to ship the castings to Cornwall. Although there were a number of small brass foundries in the county at the time, all iron castings arriving in the county were seaborne. In the mid-seventies, John Harvey, a blacksmith of Gwinear, near Camborne, saw the desirability of an iron foundry near to the mines to enable breakages to be repaired speedily. Consequently in 1776 he took a cargo of scrap iron to Neath and on this visit learned the art of making cast-iron pipes. Some two or three years later he moved from Gwinear to waterside premises near the creek of Hayle where he erected a blacksmiths' shop and a small iron foundry.

Having limited capital, Harvey at first carried on the business of an ironfounder on a small scale. There being no other establishment of a similar nature in the county, the mines found it very useful and convenient. Hence, it succeeded beyond Harvey's expectations and in 1780 he was obliged to enlarge its scope. At first, the products of the foundry were of a simple kind, the earliest-known reference to them being found in an account book of the Tehidy Estate of Lord de Dunstanville, in which is recorded a payment in August, 1779, of £3 18s. 4d. to "John Harvey for a cast-iron kettle for the Kennels," whilst in December, 1783, John Harvey was paid £1 9s. 2d. for cast-iron stoves for "Tehidy Kitchen."

From the correspondence of Boulton and Watt it appears that quite early in its history the Birmingham firm entrusted some of their work to the Hayle Foundry. In March, 1781, Watt sent to Henderson, the firm's representative at Redruth, an engraving of the balance bob for the United Mines, with a request that he should have a pattern made and cast. Instructions were given that the "cradle should be very-truly formed to the circle and the bed quite smooth and flat." It is possible that this job may have been a little too difficult for the new foundry, as, later in the year, Watt writing from Cusgarne in Cornwall to Boulton at Soho said, "I must draw this (Wheal Virgin) balance bob and cradle gudgeon which we must get cast with you, as Harvey takes a most unreasonable time to his jobs and charges high."

Castings for Mines

At first miscellaneous castings for the mines formed the major portion of the products of the foundry, as references to mining cost books of the period show. For example. Dolcoath paid Harvey £54 5s. 1d. in August, 1786 and £33 18s. 8d. in May of the following year. In 1788, a Cook's Kitchen entry reads: "John Harvey for 3 working pieces £76 0s. 10d.," while in February, 1789, 9s. was paid for the carriage of two working barrels from "J. Harvey, Foundry, Hayle." Some glimpses of the foundry are afforded in a duplicate letter book of the 1790's which has been preserved. In this it is stated that in October, 1791, "40 tons of Dark grey Melting Pig-iron" was ordered and in November a Bill of Exchange for £220 was forwarded in payment for the same.

The personnel of the growing establishment were frequently reinforced by recruitment of workmen from other parts of the country. In December, 1791, Henry Harvey, the son of John Harvey, was in correspondence with friends at Bristol concerning a young man whom he wished to engage for the foundry. In the course of the letter Harvey stated that the wages would be "21s. per week" and if the young man did not like the place his father would "pay his passage back." but it was felt that he would remain as it was believed "he will like Cornwall so well not to return, as Cornish girls make good wives."

Home and Foreign Markets

From a letter of March 8, 1793, to the captain of the vessel who failed to fulfil a promise to ship a cargo of pig-iron from Cardiff, it is learnt to what extent the foundry was inconvenienced. "My men which are about 20" wrote Harvey, "would be in full employ" if the promises had been kept. Of even more serious moment was the loss incurred, especially to the mines as they were in immediate want of some castings "which if not supplied in a few days may be struck idle." In July, 1793, an order was secured for some plates. Not being sure of the purpose for which they were intended, Harvey wrote accepting the order and intimated that it would be executed in about a month. "Let us know" he wrote "what use they are for, whether they must be close or open castings. I mean if they must be very smooth and even both sides such as for press plates for cloth ware. . . ." These plates were a little more difficult than anticipated and were not despatched within the specified time, for on September 9 Harvey wrote "should have cast your press plates before this but you ordered them so thin that we have missed two to one that we have cast, however, will get them ready as soon as possible." Later the account is rendered for:—"10 press plates, pattern 3/6, 9 cwt. 2 qr. 3 lb. at 23s. £11 6s. 8½d."

John Harvey made frequent journeys into the industrial parts of the country and in July, 1793, he visited London, the Kelly Works in Shropshire, Liverpool and Bristol. On this occasion his son kept him informed of happenings at home and wrote "business with us goes on very well, orders flowing in as usual and all men in very good economy; at present the greatest thing that opposes us is the slackness of water to execute the work. Rev. Mr. Robinson has just dropped us an order for castings for his refining furnace which he is now proceeding with." Remitting a Bill for pig-iron in July, 1793, Harvey wrote "Should have sent you this amount sooner but cash is so scarce in the county we have trouble to get it for the goods without taking bills of 60 days."

By degrees the skill of the workmen increased and a boring mill, to enable cylinders, etc., to be bored, was erected. Nozzles, condensers, and air pumps were made in the mid 'nineties. The former was for the engine which Richard Trevithick, jun. was erecting at Ding Dong and the latter for an engine at Wheal Jewel West being built by William Murdoch on behalf of Boulton and Watt. In 1801, the castings for Richard Trevithick's first road locomotive were made and by the 1840's the foundry had so developed that the largest work of the period was being executed for home and foreign markets.

W. H. DORMAN & COMPANY, LIMITED—Mr. Ian MacLeod-Smith, general sales manager of the company, has been elected a director.

H. W. KEARNS & COMPANY, LIMITED—Vice-Admiral Sir Frank Mason, formerly Engineer-in-Chief of the Fleet, has been appointed a director.

Company News

GASKELL & CHAMBERS, LIMITED, engineers, coppersmiths, and brassfounders, etc., of Birmingham—The final dividend is being raised from 25 per cent. to 30 per cent. for 1957, to make 35 (30) per cent. After tax of £120,172 (£96,026), the group net profit of £86,873 compares with £74,428. There is added £5,846 (£4,490) unrequired tax.

JOHNSON & PHILLIPS, LIMITED, manufacturing electrical engineers, of Charlton, London, S.E.7—The company, which passed its interim dividend, announces a 5 per cent. payment (total of 10 per cent.). Group trading profit recovered from £321,507 to £405,637 in 1957, while total income, including £50,000 (nil) profit on sale of investment, amounted to £480,341 (£351,210). Net profit is £91,245 (£33,565), after tax of £98,000 (£62,780).

W. WILLIAMS & SONS (HOLDINGS), LIMITED, nonferrous metal founders, etc., of Cardiff.—A dividend of 6 per cent. for the period June 28 to December 29, 1957, or at a rate of 12 per cent. per annum, is being paid by the company, against a forecast of 10 per cent. per annum last September, when a quotation was granted at Cardiff. Profit for the year to December 29, was £114.600; after taxation of £39,990 the net profit was £74,610.

COWLISHAW, WALKER & COMPANY, LIMITED, mining machinery manufacturers, etc., of Biddulph, Stoke-on-Trent—The distribution for 1957 is being raised by 5 per cent. with a 20 per cent. dividend declaration. In 1956, there was a 10 per cent. dividend and a 5 per cent. bonus. Net trading profits expanded from £194,528 to £323,468. After provisions for directors' remuneration, tax, and depreciation, the net profit of £129,676 compares with £78,127.

RANSOMES & RAPIER, LIMITED, engineers and ironfounders, of Ipswich (Suffolk)—In view of the merger with Newton, Chambers & Company, Limited, having been declared unconditional, no final dividend for 1957 is being recommended. A 2 per cent. tax-free interim was paid on a capital increased by a one-for-five rights issue. On the smaller capital 7 per cent. net was paid in 1956. A net profit of £112,677 compares with £96,522, after tax of £111,995 (£107,869).

WOODALL-DUCKHAM CONSTRUCTION COMPANY, LIMITED—The company reports an expansion in group profits of £1,087,064 to £1,264,938 for 1957. The net profit is up from £537,609 to £644,048. A final dividend of 15 per cent. is recommended, making 20 per cent. on the £1,268,889 ordinary capital as increased by a 100 per cent. scrip issue and the issue of shares against the acquisition of United Fireclay Products. This is as forecast. A total of 25 per cent. was paid on the former £600,000 capital for 1956.

Recent Wills

GIBBS, LEONARD, of Tanworth-in-Arden (Warwickshire), formerly a director of Tube Investments, Limited	£90,339
LANDON, H. W., senior partner of H. W. Landon & Bros., sheet metal stampers, etc., of Birmingham	£17,454
IMRIE, JOHN, retired fuel technologist, of Charlton Kings (Glos), formerly of Totley Rise, near Sheffield	£6,785
MURDOCH, ALEXANDER, former chairman and managing director of the Singer Manufacturing Company, Limited, Clydebank	£22,507
FROST, H. N., a director of Frost & Sons (Tividale), Limited, galvanizers, and Frost & Sons (Moxley), Limited, and for a long time a member of the Birmingham Iron Exchange	£114,486

Law Cases

Routine Inspection of Machinery Essential

At Wolverhampton County Court, Judge T. W. Langman awarded £220 damages to an employee of Joseph Sankey & Sons, Limited, Bilston, in a claim made concerning an accident at the company's works on February 5, 1955. Mr. Nicholas Tschubenko, who had been injured when a tool flew away from a grinding wheel, claimed that the company had been negligent in permitting the wheel-bearing to be so worn that the wheel "wobbled."

For the company it was pleaded that no worker had complained about the faulty bearing and that an inspection showed only very slight bearing wear. A consultant engineer told the court that no amount of bearing wear would cause the wheel to contradict gyroscopic force and "wobble." Another workman, however, Mr. Phillip William Bourne, supported the plaintiff's contention that the wheel had been "wobbling" for some time before the accident. Further evidence was given by a maintenance foreman, Mr. Stanley Cox, who said that the machine was not given routine inspection; the management tended to rely on complaints by operators before making repairs.

Giving judgment, Judge Langman said that possibly the plaintiff made a slight mistake in handling the tool, but the evidence he had heard from skilled workmen led him to the conclusion that the wheel was defective and the accident was due to "wobble." "I am satisfied that there was no regular inspection of his machine to see whether it was running safely," he said, adding "it is not sufficient for a management to rely on complaints."

Fumes from Furnace Cause of Accident

Judgment was entered against Bryant & Stenner, Limited, metallurgists and non-ferrous founders, of London, S.E.1, in the High Court in an action brought by a former employee, Mr. Ernest Arthur Wickwar (66), a brass moulder. Awarding the plaintiff £10,300 damages and costs, Mr. Justice Devlin said that Mr. Wickwar, who fell face forward on a furnace, suffered "terrible injuries." He was badly disfigured. One eye was removed; the other is virtually sightless.

The company denied liability and maintained that the accident, which took place in October, 1954, happened in the plaintiff's lunch hour and that he was himself to blame.

After a four-day hearing, a jury found that Mr. Wickwar was overcome by carbon monoxide given off by the furnace and that the firm should have foreseen that fumes or other impurities given off by the furnace were likely to be injurious.

S. G. Iron Producers' Association

The annual general meeting of the British S.G. Iron Producers' Association was held on April 29. An election of officers took place which resulted in the re-election of the chairman, Mr. W. R. Cooper (Lloyds (Burton), Limited); the vice-chairman, Mr. H. J. V. Williams (John Williams & Sons (Cardiff), Limited); and of the hon. treasurer, Mr. P. A. Russell (S. Russell & Sons, Limited).

The guests of the Association at the luncheon, held in the Connaught Rooms, London, which followed the meeting, included Mr. F. Dickinson, Dr. A. B. Everest and Mr. W. W. Braidwood from the Mond Nickel Company, Limited; Dr. J. G. Pearce and Mr. H. Morrogh, of the British Cast Iron Research Association, and Mr. A. C. P. Westhorpe, of James Barwell (South Africa), Limited.

National Foundry Craft Training Centre

Good progress is revealed in the recently-issued annual report of the National Foundry Craft Training Centre. The following information is contained in the report:—

Since the Centre opened the same pattern of organization has been followed for the training programme. Apprentices attend for one month at a time, the full programme occupying four one-month courses. These four courses are normally spread over four years during the period of apprenticeship.

During 1957, three first courses were held at which 38 trainees enrolled; at the three second courses 37 attended; 35 were present for the three third courses and the two fourth courses were attended by 20 students. Each year the management committee has the task of balancing new intakes with return attendances. The difficulties inherent in this, together with the failure of a small number of apprentices to return for training when due, have in previous years resulted in the total attendances falling below the maximum capacity. This did not apply in 1957, when more new applications than ever before were made and there were only one or two trainees who were unable to return to the Centre when due. The trustees and the management committee regard these as encouraging trends which are evidence of a growing appreciation of the value of the Centre.

Residential Club

The residential club can accommodate 12 trainees at a time and, with the larger numbers attending in 1957, was full practically the whole year. It provides comfortable surroundings, good meals and room for private study and recreation. Many improvements and additions were made to the club particularly during the first half of the year.

Reports and Certificates

Each of the 130 apprentices is assessed by the instructor in charge of the Centre at the beginning of his course. His progress during the month at the Centre is closely followed and a comprehensive test set at the end of the course. On the basis of the information so gained, a full report, completed by both the instructor and the warden, is sent to the firm employing the apprentice. During 1957, the management committee—who inspect all reports before they are sent out—received further evidence of their value. Not only do they assist employing firms to make a sound assessment of a particular apprentice, but they often indicate to the firm what can be done in the foundry to improve his training. The 20 apprentices completing their fourth course during the year all gained their certificates. These were presented to them at a dinner held at the end of each fourth course. Trustees, members of the management committee and visitors have been in attendance at these dinners held during the year.

Visits to Foundries

As part of the training programme in 1957, visits were made to the foundries of the following companies:

W. & T. Avery, Limited, Walsall; Belliss & Morcom, Limited, Birmingham; Birmingham Aluminium Castings (1903) Company, Limited, Smethwick; Castings, Limited, Walsall; Coneygre Foundry, Limited, Tipton; General Electric Company, Limited, Birmingham; Horseley Bridge & Thomas Piggott, Limited, Tipton; Hunt Bros. (Oldbury), Limited, Oldbury; F. H. Lloyd & Company, Limited, Wednesbury; Midland Electric Manufacturing Company, Limited, Birmingham; Phosphor Bronze Company, Limited, Birmingham; Shotton Bros. Limited, Oldbury; Simplex Electric Company, Limited; Oldbury; and John Thompson (Wolverhampton), Limited, Wolverhampton.

The report states that the management committee are always pleased to arrange to see representatives of companies interested in the Centre. A considerable number of visits have been made during the year by directors, foundry managers, and personnel managers of firms contemplating sending trainees to the Centre.

Future Prospects

The Trustees and the management committee have been greatly encouraged by the increased use being made of the Centre by the foundry industry. However, this has resulted during the year in there being more delay in accepting apprentices for first courses than is desirable. To meet this situation and to provide for further expansion in the future, far-reaching plans have been drawn up for a new Centre.

Balfour's New Research Centre

Work has started on the new £130,000 Research and Development Centre at Leven, Scotland, for the Balfour group of companies. The main objective of this undertaking is to carry out development work for improvement in the design and operation of chemical process plant for many industries, and to widen the application, fabrication techniques, and uses of new materials of construction.

The new Centre will, however, have other important functions. It will be available to demonstrate the application of existing designs of plant and process methods to clients' materials, to pioneer new processes and techniques, and to carry out work, without obligation, which would not justify the installation of special pilot plant by individual manufacturers themselves. Thus a confidential laboratory with semi-scale plant facilities will be available as a service. This should be particularly helpful for smaller firms. The Centre will provide training facilities in every sphere of chemical engineering. A student and graduate apprenticeship scheme has already been launched in conjunction with local technical colleges to enable suitable young men and women to reach full professional status, and at the same time to receive practical training in industry.

The companies which comprise the Balfour Group already have over 1,100 personnel at Leven in the existing works. The new Centre is the first stage in the development of a recently-purchased 25-acre site which will ultimately contain further fabrication shops and offices. The main pilot plant bay will be 160-ft. long, 45-ft. wide, 30 ft. to the eaves, with a tower giving a headroom of 40 ft., but capable of expanding to 56 ft. A separate pilot plant laboratory will deal with size reduction, with special reference to dust problems. There will be a specially isolated laboratory for solvent extraction and work with inflammable solvents and noxious gases. Here radio-active material can be dealt with in comparative safety.

In addition, there will be metallurgical laboratories, dark rooms, a corrosion laboratory, a physical chemistry laboratory, a general analytical laboratory, a chemical development laboratory, and two ceramic chemistry laboratories for the glassed steel process of Enamelled Metal Products, Limited. The new laboratories will be opened officially in the spring of 1959.

News in Brief

THE ANNUAL GENERAL CONGRESS of the *Bureau International de la Récupération* will be held from May 21 to 23, in Brussels.

NEWMAN INDUSTRIES, LIMITED, of Yate, Bristol, have been appointed sole selling agents in the United Kingdom for all Hungarian heavy machine tools.

THE 95TH ANNUAL GENERAL MEETING of the Institution of Gas Engineers is being held in London from May 13 to 16. An excellent programme has been arranged.

THE YALE & TOWNE GROUP recently held a three-day conference at the Trianon Palace, Versailles, to study the impact of the Common Market on the future of their business.

GENERAL REFRACTORIES, LIMITED, gave a week's notice to 32 employees at their Worksop works on Saturday, April 26, because of redundancy and a reorganization scheme.

Mr. W. D. PUGH, managing director of English Steel Corporation, Limited, Sheffield, welcomed 33 overseas agents to the Corporation's seven-day conference of overseas agents which opened in Harrogate on May 2.

THE MINISTRY OF SUPPLY has awarded a contract valued at £40,000 to W. H. Dorman & Company, Limited, Stafford, for 30 Dorman 6KUF type diesel engines for delivery this year to drive rotary snow blowers on airfields.

AN ORDER worth more than £500,000 has been awarded to the Incandescent Heat Company, Limited, Smethwick, for the supply of heat-treatment furnaces in connection with the Argentine national steel plan for an integrated works being built at San Nicolas, near Rosario.

SHORT-TIME WORKING now involves four of the six rolling mills at the Park Gate Iron & Steel Company, Limited, Rotherham. Associated workers and maintenance men are working fewer hours, and a reduction is being made in the number of open-hearth-furnaces in operation.

LANCASHIRE DYNAMO & CRYPTO, LIMITED, announce price reductions in their range of British Standard dimensioned totally enclosed fan-cooled SCR motors up to 25 h.p. (B.S. 2083). Price reductions were also made recently in the company's range of B.S. ventilated motors to B.S. 2960.

DEMONSTRATIONS OF MODERN BARRELLING are being given at the Birmingham Exchange & Engineering Centre, Stephenson Place, Birmingham, 2. The times of opening are 9 a.m. to 6 p.m. daily with the exception of Thursday, May 15, when the exhibition will be open until 9 p.m.: the closing date is May 16.

NET REGISTERED TONNAGE of ships entering the ports of the Tees in the six months ended April 30 increased by 500,000 tons to 2,847,091 tons. Five months' imports, amounting in the aggregate to 2,297,177 tons, were up 400,000 tons and in that period the ports' revenue increased from £172,508 to £244,702.

THE 1958 ASSEMBLY of the International Organization for Standardization—ISO—will be opened at Harrogate on June 9 by its president, Sir Roger Duncalfe. It will be the first occasion on which this triennial conference has been held in Britain and a record attendance of some 1,000 delegates is expected.

SHORT-TIME WORKING came into operation last week for 200 men at the Sheepbridge Company, Limited, of Chesterfield, because of the shortage of orders. A four-day week will be instituted for the men in the rolling mills wagon department and sawmills. According to an official, the four-day week will be in operation until orders pick up.

BRITISH-BUILT SUPER Beaver extra-heavy-duty diesel-engined four-wheeled vehicles supplied by Leyland Motors, Limited, make up the bulk of the fleet of trucks of the Khanaqin Oil Company, Limited, which is responsible for oil distribution throughout Iraq. The company's tankers and delivery vehicles operate in some of the most gruelling conditions in the world.

NORWAY'S STATE-OWNED steel concern, A/S Norsk Jernverk, states in its annual report that it delivered 178,000 tons (including 158,000 tons from the main plant at Mo i Rana) of steel goods last year, 128,000 tons being exported, including 12,000 tons of black sheet. Altogether 20,000 tons of black sheet, produced by the subsidiary, Norsk Blikvalseverk, Bergen, was produced.

NEW AND EXTENSIVE FACILITIES for research into mechanisms and metrology and heat-transfer are now available at the Mechanical Engineering Research Laboratory, of the Department of Scientific and Industrial Research, at East Kilbride, near Glasgow. Visitors to this year's "open days" at the Laboratory on June 4 and 5, will be able to see the important work now going on in these fields.

THE FORMATION OF A NEW COMPANY is announced by Croda, Limited, Snaith, Goole, Yorkshire. The company is called Croda Belge with head office at Verviers. The president of the company is Mr. F. A. S. Wood, managing director of the Croda organization, which already has associate companies in the US and Italy. The managing director is Mr. Werner Daveloose, a Flemish industrialist.

SERIOUS DAMAGE to the foundry of Smith & Grace, Limited, Thrapston, Northants, was prevented when children playing nearby saw a portable partition on fire and gave the alarm to Mr. Jack Smith, a director of the firm, who lived in the neighbourhood. He and the children fought the fire with an extinguisher and buckets of water, until Thrapston firemen arrived. Mr. Smith said the fire possibly started through flying molten metal from one of the castings.

A FOUR-DAY WEEK for 100 men in the fettling shop is to be introduced at the Wednesbury steel foundry of F. H. Lloyd & Company, Limited. Mr. Michael Lloyd said on April 28 that it was hoped the new arrangement would be only temporary. He added: "The four-day week is not due to any recession but rather to changes in the type of production which is temporarily resulting in a lower tonnage output from certain sections of the factory." The company employs 1,900 workers.

SPEAKING AT THE ANNUAL MEETING of the Gloucestershire Productivity Association at Gloucester last month, Mr. E. W. Hancock, director of special products for the Rootes Group, appealed to trade unionists to "look again at the 168 hours in a week. This idea of working for 40 hours is hopeless," Mr. Hancock said. "We have to find a way to work our plant for more hours. Let us not be afraid of new ideas and development." He added that flexibility of work within factories was essential.

EMPLOYEES OF HIGH DUTY ALLOYS, LIMITED, Redditch, met on April 26 to discuss the threat of redundancy at the works. A statement issued afterwards said "very great resentment" was felt at the refusal of the company to operate a shorter working week as an alternative to redundancy. Also that it was decided to ask the full-time officials of the unions to

open negotiations for a shorter working week and for a "redundancy formula for the identification of the surplus labour if any."

JOHN BOYD & COMPANY, (ENGINEERS), LIMITED, Annan, have received the official order from British Railways for the design, manufacture and erection of four 40-tons lifting capacity electric overhead travelling cranes for Crewe Locomotive Works. These cranes are required for handling the new diesel-electric locomotives. Mr. John Boyd states that he has sufficient orders on hand to keep all departments of his works in full production for at least two years. A further extension to the works would be carried out this summer.

THE VICE-CHANCELLOR of the University of Cambridge has announced that Imperial Chemical Industries, Limited, has offered to continue the ICI fellowship scheme for another five years from the beginning of October. If the offer is accepted, the company intends to make provision for nine fellowships at the university instead of 12 as at present. This would facilitate the allocation of fellowships to universities not now included in the scheme. The company is prepared to pay Cambridge £8,100 per year for the five years.

NEARLY ONE THOUSAND EMPLOYEES, directors and friends of Taylor Bros. (Sandiacre), Limited, assembled at the Sherwood Rooms, Nottingham, recently, to celebrate the firm's centenary. The firm are railway engineers and ironfounders and many of Great Britain's complex station and junction layouts have been fabricated in the company's works. At the gathering the managing director, Mr. Leonard Taylor, presented long-service awards. Silver vases were given to 22 employees who between them had served the firm for a total of 986 years.

WALLSEND SHIPBUILDERS Swan, Hunter, & Wigham Richardson, Limited, and the Nuclear Power Plant Company, Limited, are to collaborate in the design and construction of nuclear-powered ships. Announcing this at the annual meeting of Swan, Hunter, & Wigham Richardson in Newcastle-upon-Tyne last week, Mr. E. J. Hunter, the chairman, said that both companies would press ahead with the project. The type of ship to be designed and built would depend on the circumstances and the direction in which it was most likely to prove most fruitful.

THE WORLD'S FIRST GAS-TURBINE CAR to be demonstrated in public, Jet 1, went into retirement on April 30. It was sent by the Rover Company, Limited, of Solihull, to the Science Museum, Kensington, where it will form part of the new transport section to be opened at the Museum shortly. Jet 1 was first shown to the public in 1950. A year later it won for the Rover Company, the RAC Dewar Trophy for outstanding technical achievement. It has outlived its usefulness now that Rovers have the more advanced T 3 model in the gas-turbine development programme.

THE CITY AND GUILDS OF LONDON INSTITUTE, Gresham College, Basinghall Street, London, E.C.2, has published details of a course (No. 229) in technical authorship. The course of training recommended has been designed with the needs of the younger entrants in mind, but the examinations will also be open to practising technical authors. The intermediate examination will be offered for the first time in 1960, and the final examination in 1961. Specimen examination papers will be prepared and issued in the autumn to technical colleges interested in setting up courses.

A NEW FACTORY now being built on a 25-acre site in Glasgow will enable British Oxygen Gases, Limited, to meet increased demands for their industrial gases in Scotland. It is anticipated that the buildings will be completed in 12 months. The new tonnage oxygen plant supplied by British Oxygen Linde which has been erected at Shell Haven on the Thames Estuary by British Oxygen Engineering, Limited, was completed at the end of April and is expected to be fully commissioned in August. The plant is designed to produce 240 tons of oxygen and 253 tons of nitrogen a day for the manufacture of ammonia.

VICKERS-ARMSTRONGS (TRACTORS), LIMITED, is undertaking a major reorganization scheme in an effort to reduce costs. "A recession in the world demand for heavy earth-moving equipment has already been well publicized and we, like our competitors, have been affected," the company states. "Inevitably competition for a slice of the smaller cake is fiercer than before, and the reorganization at present in progress at our Scotswood works is a major step we have to take to obtain greater efficiency and to reduce costs." In the last two weeks 160 workers have been paid off due to the reorganization, and it is understood that about one-fifth of the staff will be declared redundant.

SPRINGS SPECIALLY DESIGNED and made at the West Bromwich works of Geo. Salter & Company, Limited, have played an important part in the Ministry of Works' big job of lifting and restoring the great fallen stones of Stonehenge. Incorporated in the massive lifting gear were 48 Salter springs—each 13-in. high and 4½-in. dia.—which acted as "cushions" when the stones were lifted, and prevented shock loadings being transmitted to any particular part of the stones containing cracks. One of the stones weighed more than 50 tons and measured 21 by 8 by 4 ft. It is expected that all the work of restoration will be completed by June 21—the longest day—when the Druids go to Stonehenge at dawn for the ceremony of the Summer Solstice.

IT IS REPORTED THAT AS A RESULT of the fall in export sales the Manor Mills, Birmingham, factory of the Hercules Cycle Company is shortly to be closed. A spokesman for the management said that it had been found necessary to transfer the production of cycle components to the factory at Newton, Montgomeryshire. The Newton plant belongs to the Smethwick company of J. A. Phillips, Limited, which is part of the Tube Investments group. It was stated that several overseas countries have closed their markets to the import of cycles and it had to be recognized that a new level of trade now exists. It is understood that about 500 workers will be affected by the closure. Union officials said that the management had agreed to apply the terms of an agreement on reorganization which provides for compensation of up to 10 weeks wages to employees declared redundant, according to length of service.

THE FIRST MEETING of the newly-formed Recruitment and Training Committee for the foundry industry of Walsall was held on April 21. Members of the foundry trades and trade union representatives who attended, decided that a concerted effort was necessary to attract the right type of apprentice into the trade. It was emphasized at the meeting that the foundry industry could offer now, more than ever before, opportunities for apprentice craftsmen and those who wished to progress into the planning and supervisory grades. The committee is to organize film shows and arrange lectures. Also envisaged is a scheme of annual awards and prizes of certificates which will be available to successful apprentices in any examinations in special training schemes which are to be set up. Employers' representatives elected to the committee were Mr. H. G. Hall, chairman, Mr. G. W. E. Evans, secretary, Mr. T. Gameson, Mr. L. B. Parkes, Mr. M. M. Hallett and Mr. C. A. Bickley.

Personal

Sir WILLIAM Y. DARLING has resigned from the board of Bruce Peebles & Company, Limited, Edinburgh.

Mr. G. AYMER BARROW has been elected president of the National Federation of Scrap Iron, Steel and Metal Merchants. He succeeds Mr. FELIX L. LEVY.

Mr. SEBASTIAN Z. DE FERRANTI has been appointed managing director of Ferranti, Limited, in place of Sir VINCENT DE FERRANTI, who remains chairman.

P. I. Castings (Altrincham), Limited, announce the appointment of Mr. R. L. HOPKINS as their technical representative in Scotland and the Newcastle area.

Mr. T. B. PRESTON has for health reasons resigned from the office of managing director at Mitchell Russell & Company, Limited, Bonnybridge. He is succeeded by Mr. JOHN LIDDELL.

Mr. F. AINSCOW has been appointed a director of Tilghman's, Limited, and of George Richards & Company, Limited, subsidiaries of the Staveley Coal and Iron Company, Limited.

Air Marshal Sir R. OWEN JONES, K.B.E., C.B., A.F.C., has been elected to succeed Sir GEORGE NELSON, BART., LL.D., as president of the Institution of Mechanical Engineers for the ensuing year.

Mr. WILLIAM ARTHUR MELLORS was presented with a chiming clock by the directors of the Northern Malleable Foundry Limited, Derby, to mark his 21 years' as a moulder with the firm.

Mr. S. M. MAUDE, lecturer on production engineering at Keighley Technical College, has been appointed works manager of Anderton Springs, Limited, Bingley, and Dee-Kay Engineering Company, Limited, precision engineers, also at Bingley.

Mr. H. NORMAN G. ALLEN, managing director of the Bedford electrical engineering firm of W. H. Allen, Sons & Company, Limited, has accepted the invitation of the British Transport Commission to become a member of the Research Advisory Committee of the Commission.

Mr. H. R. SMITH, senior industrial gas engineer, Notts and Derby division, East Midlands Gas Board, has been elected president of Derby Society of Engineers. Mr. Smith has served on the committee of the Society for four years, and is also a member of the Institution of Gas Engineers.

Mr. TOM ARCHIBALD, works manager of the Blantyre Engineering Company, Limited, Hamilton, has retired. He served his apprenticeship with Goodwin, Bruce & Govan, Limited, and worked with that company until the factory was taken over by the present firm 42 years ago. He has 51 years' service at the works.

Mr. SAMUEL AYRTON and Mr. LEON LUBETT, who have been associated for many years in the operations of Ayrton Metals, Limited, have been appointed directors of a new company, Ayrton & Partners, Limited, formed to deal in non-ferrous metals, ores, and minerals. Mr. ERIC LIPMANN is also joining the board.

Mr. T. C. BAILEY, sales manager (industrial fuels), Shell-Mex and B.P., Limited, is to be the next president of the Institute of Fuel. He takes office next October. This will be only the second time that a member of the oil industry has held this office. The whole of Mr. Bailey's career has been on the marketing side of the oil industry.

Mr. T. HARVEY, who has been with Rose Brothers, Limited, pioneers in the automatic packaging of goods, Gainsborough, for 55 years, retired on May 5. When Mr. Harvey joined the firm as a boy, only 150 men were employed compared with the present 2,000. Mr. Harvey has travelled in many countries and attended world fairs with the firm's machines.

Mr. R. C. HESKETH-JONES has been appointed chief executive, overseas, at the head office of the British Oxygen Company, Limited. He has been succeeded as sales director, industrial division, of British Oxygen Gases, by Mr. R. J. FOSTER. Captain Q. P. WHITFORD has been appointed to take charge of the aircraft equipment works of British Oxygen Engineering at Harlow.

Mr. W. L. FLETCHER, managing director of Tees Side Bridge & Engineering Works, Limited, has been appointed chairman of the Northern Regional Board for Industry's district advisory committee for Teesside. He became a member of the committee in 1953. Mr. Fletcher succeeds Mr. J. E. TYRIE, organizer and district officer of the National Union of General and Municipal Workers, who takes his place as vice-chairman.

Edgar Allen & Company, Limited, announce the appointment of Mr. FRED HAIGH, as personal assistant to Mr. B. B. Green, a director and general sales manager of the company. Mr. Haigh joined the company in February, 1938. Returning from war service, he was appointed assistant labour manager, and later commercial manager of the steel foundry division. The appointment of Mr. E. ASHURST to succeed Mr. Fred Haigh as commercial manager of the foundry division is also announced.

Obituary

Lieut-Col. MATTHEW SMITH SPENCE, a director of John Spence & Sons (Airdrie), Limited, brassfounders, died on May 6 in a Glasgow hospital at the age of 75.

Mr. WILLIAM GILDROY SHAW, formerly chairman of William Shaw & Company, Limited, steel founders, Middlesbrough, has died at the age of 57. The firm was founded by his grandfather, and Mr. Shaw joined it in 1923 after coming down from Cambridge. Ten years later he became joint managing director and was chairman when he retired in 1951.

Mr. ARTHUR H. WAINE, a director of Hadfields, Limited, Sheffield, died suddenly in Brussels on May 4, at the age of 57. He was on a business tour for the firm and had been to the Hanover Trade Fair where the firm exhibited. Mr. Waine had been with Hadfields for 40 years and was director in charge of forgings. He was also managing director of the subsidiary, Hadfields Forgings, Limited. He was educated at Dronfield Grammar School and Sheffield University and gained the Associateship in Metallurgy and the Associateship in Engineering, and was awarded the Mappin Medal in 1930. He was a substitute Councilman of the British Iron and Steel Federation, a Fellow of the Institution of Mechanical Engineers, a member of the Iron and Steel Institute, and a member of the Sheffield Society of Engineers and Metallurgists.

Board Changes

HARLAND & WOLFF, LIMITED—Mr. H. C. MacEwan has resigned from the board.

CLARKSON (ENGINEERS), LIMITED—Mr. B. Clarkson has been appointed a director.

J. STONE & COMPANY (HOLDINGS), LIMITED—Mr. K. H. Preston has resigned from the managing directorship of the company and has been appointed executive chairman. Mr. B. W. Preston and Mr. A. J. S. Brown have been appointed joint managing directors.

Imports and Exports of Iron and Steel in March

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in March. Totals for the first three months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended March 31.	Three months ended March 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Channel Islands	417	1,022	1,191
Cyprus	890	2,495	2,175
Sierra Leone	362	4,192	2,330
Ghana	1,387	5,070	3,901
Nigeria	3,891	15,040	15,774
Union of South Africa	11,344	27,436	28,145
Rhodesia and Nyasaland	4,409	18,021	11,450
Tanganyika	1,302	6,810	3,347
Kenya	6,372	11,812	13,463
Uganda	342	1,174	868
Mauritius	142	859	1,112
Aden	266	1,256	1,337
Bahrein, Qatar, and Trucial States	648	3,987	2,296
Kuwait	4,010	7,076	9,990
India	8,337	81,687	28,922
Pakistan	3,992	13,222	26,274
Singapore	2,086	10,905	9,324
Malaya	1,736	10,409	5,057
Ceylon	1,432	8,302	6,655
British North Borneo	118	859	474
Hongkong	4,256	29,170	12,244
Australia	4,391	49,289	20,316
New Zealand	16,141	47,775	50,481
Canada	10,808	55,948	40,929
Jamaica	1,453	4,651	5,529
Trinidad	2,352	10,211	11,918
British Guiana	784	1,442	1,838
Other Commonwealth countries	4,830	8,303	10,069
Eire	4,673	11,113	13,124
Finland	3,592	22,983	11,712
Sweden	16,118	25,586	40,203
Norway	8,290	28,084	24,320
Denmark	6,440	29,074	23,001
Western Germany	2,135	5,190	3,628
Netherlands	7,647	29,630	20,070
Belgium	1,911	10,634	6,487
France	321	3,731	713
Switzerland	1,293	6,351	3,501
Portugal	1,504	5,265	3,996
Spain	4,442	12,693	13,363
Italy	3,886	15,183	10,075
Austria	1,149	923	4,176
Yugoslavia	486	2,049	1,344
Greece	369	1,652	3,751
Turkey	335	1,688	1,242
Netherlands Antilles	188	1,430	393
Portuguese East Africa	331	1,284	946
Egypt	2,805	409	8,910
Sudan	2,876	5,456	8,720
Lebanon	1,705	1,156	5,546
Israel	1,314	1,166	2,590
Saudi Arabia	452	1,537	1,832
Iraq	2,180	8,720	7,612
Iran	2,724	11,548	7,470
Burma	868	4,224	2,540
Thailand	911	1,655	2,102
Indonesia	110	1,190	761
Philippine Republic	103	292	582
USA	7,690	11,543	20,129
Cuba	987	1,706	1,938
Colombia	359	950	1,847
Venezuela	9,472	23,845	26,835
Ecuador	144	877	1,145
Peru	1,943	3,183	4,241
Uruguay	51	2,314	417
Argentina	8,209	18,505	33,733
Other foreign countries	8,749	44,866	32,280
TOTAL	217,260	798,108	684,693

Total Imports of Iron and Steel

From	Month ended March 31.	Three months ended March 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	828	1,229	1,830
Canada	1,473	9,232	4,828
Other Commonwealth countries and Eire	1,710	5,548	6,140
Soviet Union	16,078	45,486	42,355
Sweden	3,497	9,190	9,097
Norway	8,928	31,498	22,527
Poland	—	4,271	15
Western Germany	13,110	32,538	26,624
Netherlands	12,077	17,563	35,672
Belgium	7,852	46,955	26,697
Luxembourg	1,257	11,238	2,809
France	1,404	21,959	8,091
Italy	1,012	777	1,061
Austria	220	25,153	1,297
Japan	288	4,661	929
USA	19,772	44,341	73,028
Other foreign countries	628	10,058	1,327
TOTAL	90,134	321,697	264,327
Iron and steel scrap and waste, fit only for the recovery of metal	14,230	155,197	42,380

Exports of Iron and Steel, by Products

Product.	Month ended March 31.	Three months ended March 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Pig-iron	4,591	46,913	15,734
Ferro-columbium (niobium)	4	41	9
Ferro-tungsten	64	238	100
Other ferro-alloys	339	906	851
Ingots, blooms, billets, slabs, sheets, and tinplate bars	477	443	2,719
Iron bars, rods, angles, shapes, and sections	217	402	406
Steel bars, rods, angles, sections, and shapes	33,114	124,854	98,446
Iron plates and sheets	1,144	40	1,478
Universal plates	280	1,240	892
Steel plates, ⅛ in. and under ¼ in.	771	2,699	2,323
Ditto, ¼ in. and over	21,440	47,362	54,212
Blacksheets and blackplate	22,740	89,077	81,291
Hoop and strip	6,745	25,643	16,214
Tinplate	24,665	99,178	80,719
Decorated tinplate	158	1,065	652
Galvanized sheets	4,538	54,235	14,603
Other (incl. tinned sheets, terneplate, and ternesheets)	1,318	6,022	3,807
Railway and tramway construction material	19,927	67,437	62,376
Wire rods of steel (incl. alloy steel)*	2,506	10,606	9,552
Wire	10,010	27,891	28,183
Tubes, pipes, and fittings	60,796	188,532	206,523
Iron castings	160	459	691
Steel castings	340	859	844
Forgings	916	1,966	2,068
TOTAL	217,260	798,108	684,693

* The figures for 1958 are not completely comparable with those for previous years.

DUE to a slight improvement in trade the Guisborough foundry of Blackett Hutton & Company, Limited, has reverted to a five-day working week. The foundry is engaged in the manufacture of steel valves and general castings.

JOHN WALLACE & SONS, LIMITED—Mr. Reginald E. Silletto, Mr. David C. Walker, and Mr. James L. Young have been appointed directors.

Raw Material Markets

Iron and Steel

The engineering and speciality foundries maintain a good level of production of castings and the motor vehicle trade continues to provide a regular flow of orders, enabling the particular foundries to be the most favourably employed section of the industry. The overall demand for high-duty castings is much in excess of other types and, apart from the motor trade, appreciable tonnages are called for from many other users. The decline in demand continues from some sections of the machine-tool industry, and some of the foundries associated with that trade are working at a much lower rate of production.

The light foundries are unable to improve on their moderate outputs, and the work is not available to keep their plants fully engaged. A seasonal improvement in the call for light castings does not appear to have materialized judging by their demands for pig-iron. Purchase tax reductions on domestic equipment should bring some improvement in demands for castings from that trade when present stocks have been cleared. The textile foundries are also only moderately employed, and many of the jobbing foundries need more work.

Raw materials could satisfy a much larger demand than at present. For the foundries requiring the low-phosphorus irons and hematite adequate tonnages are available and refined iron makers could undertake much larger demands. Outputs of the high-phosphorus irons are much in excess of demands and there is at present no sign of any appreciable change in this position. Apart maybe from the low-phosphorus irons, most producers of other grades have plenty of pig-iron to spare, with consignments available for shipment abroad when orders can be obtained. Competition from overseas producers, however, is very keen as they too are anxious to dispose of stocks.

The foundries are able to obtain all the scrap they need, and deliveries of foundry coke, ganister, and limestone are satisfactory.

Many of the re-rollers are still compelled to work a reduced number of shifts. Difficulty is experienced in obtaining sufficient orders to keep the mills going at this level and rolling programmes are fixed on a day-to-day basis. The present demand for all of their products from home sources is at a low level, particularly for sections and bars. Export business is also scarce as prices are not competitive with those of foreign producers. Home steelworks can easily meet the demand for steel semis and a much larger call for supplies could be undertaken without difficulty. Stocks of billets, etc., at the re-rollers are still fairly heavy and until these are reduced there is little prospect of any increased call for supplies.

The re-rollers have been advised of a reduction of 30s. per ton in the price of defective billets, blooms, and slabs, effective from May 1, and this may assist the steelworks in disposing of some of their surplus stocks, although it is generally considered that the concession in price is too small and that the revised prices are still unattractive.

Non-ferrous Metals

The copper market is firm in London, but weak in New York. In London, despite daily reports that an early settlement of the Chuquicamata strike now seems likely, the metal price has gone ahead. Indeed, business this year is estimated to be not far short of last year's. Moreover, with reports circulating that licences will be granted for an additional tonnage of copper wire to be shipped to China in the second half of this year, the outlook is far from bleak. Yet reports from America are not encouraging. Demand is falling away from almost every section of the non-ferrous industry and there are no visible signs of a revival of demand. Nevertheless, the custom smelters are maintaining their price at 23¾ cents a pound, and the producers their price of 25 cents a pound.

On the Continent, wire bars are in better supply and the premium is now beginning to run off. Discussions this week in London between copper producers and consumers resulted in the view being expressed that the long-term interests of copper could best be served by leaving the industry to look after its own affairs. Copper stocks in London dropped for the third successive week and now stand at 17,707 tons.

Tin has been a firm market, and at the end of last week the three months' metal price was over £740 a ton. This rise followed a stronger tone in the East due to the belief that pipeline stocks are now exhausted. However, London, still taking its cue from the East, has reacted this week, with the cash price down to the support level of £730 a ton.

Statistics released by the International Tin Council reveal that world consumption of tin last January was over 2,000 tons lower than in January, 1957. Consumption in the US was down from 5,440 tons to 3,950 tons, and in the UK from 2,134 tons to 1,734 tons. The council now estimates that tin usage in the whole of 1957 totalled 157,000 tons. In America the market is erratic and the price is fluctuating between 94 cents and 95 cents a pound.

Lead and zinc have moved nervously this week, awaiting the outcome of the bus strike and rail pay dispute. In general terms, however, they have been quiet markets.

In America, lead and zinc markets have experienced fluctuating demands and, on balance, indications are that stocks in the hands of consumers have reached a fairly low level. The US price for lead is 12 cents a pound and the zinc price 10 cents.

C. & L. Hill (Die Castings) Limited

C. & L. Hill, Limited (Stringes Lane, Willenhall, Staffs), announce the formation of a new subsidiary company to be known as C. & L. Hill (Die Castings) Limited, operating from Wednesfield Road Works, Willenhall, with registered office at Stringes Lane. The company has taken over the aluminium gravity-die business of W. H. Wheeldon & Company, Manchester. Their plant will be installed and the present die-casting section at Stringes Lane moved to Wednesfield Road. The new company has an advanced technique for the production of dies for aluminium gravity-die castings which will not only reduce the price but improve delivery time. The directors are—Mr. A. G. B. Owen (chairman and managing director), Mr. C. A. B. Lindop, Mr. W. A. Bannister, Mr. L. E. Morris, Mr. W. H. Wheeldon and Mr. F. Gleave.

WHYTE & EDWARDS (METALS), LIMITED, are planning to build extensions to the brass foundry in Symers Street, Dundee.

AMONGST EXHIBITORS AT THE PRODUCTION EXHIBITION, currently being held at Olympia, London, is the Mond Nickel Company, Limited, of London, S.W.1, whose stand, divided into sections dealing with spheroidal-graphite cast iron, metal finishes, Mond products and platinum metals, has been designed to show the importance of selecting suitable materials for specific problems.

Contracts Open

The dates given are the latest on which tenders will be accepted: The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

KINGSCLERE AND WHITCHURCH, May 23—Construction and maintenance of approximately 16 miles of 4-in.—8-in. dia. spun-iron water mains together with valves and fittings, and all other works incidental thereto, in the above Rural District. Documents from Lemon and Blizard, 59, Tufton Street, Westminster, London, S.W.1, on receipt of a deposit cheque, made payable to the Council, of £3 3s.

NORTH COTSWOLD RURAL DISTRICT, May 31—Supply and erection of two electrically-operated centrifugal sludge pumps in connection with Blockley, Draycott and Paxford sewerage scheme. Documents from John H. Haiste and Partners, 8-10, Southgate Street, Gloucester. Deposit £2 2s.

DENBY DALE, May 30—Construction of about 1,800 lin. yd. of concrete-lined spun-iron water mains, 8-in. dia., and incidental works. Documents from A. H. S. Waters and Partners, of 25, Temple Row, Birmingham, 2. Deposit £3 3s.

AMESBURY, May 30—Construction of approximately four miles of 6-in. dia., 4-in. dia. and 3-in. dia. spun-iron water mains, together with service connections and associated works, near Shrewton, Wilts. Documents from Lemon and Blizard, Lansdowne House, Castle Lane, Southampton. Deposit £3 3s.

PETWORTH, June 14—Construction of approx. 388 lin. yd. of 4-in. cast-iron rising main. Documents from the Senior Public Health Inspector and Engineer, "Newlands," Petworth, on payment of a deposit of £3 3s. (cheques payable to the R.D.C.).

WALTON AND WEYBRIDGE, May 31—Construction of foul water sewers at River Ash and Beasley's Ait, Walton-on-Thames. The work comprises of approx. 1,560 lin. yd. of 9-in. dia. cast-iron pipes laid at depths varying between 3 ft. and 12 ft., together with brick manholes and other incidental works. Documents from the Office of the Engineer and Surveyor, Council Offices, Walton-on-Thames.

STAFFORDSHIRE, May 19—Supply of 18-in., 12-in. and 6-in. dia. cast-iron pipes and specials for Bucknall Reservoir, for Staffordshire Potteries Water Board.

RHONDDA, June 3—Glamorgan pit water scheme, contract 2. Construction of a treatment plant, ancillary road works, drains, cast-iron mains, storage and settling tanks within the curtilage of the site. Contract documents may be obtained from the Council's Consulting Engineers, Thomas and Morgan and Partners, 23, Gelliwastad Road, Pontypridd, on the payment of a deposit of ten guineas by cheque made payable to the Rhondda Borough Council.

WIGAN, LANCS, June 9—Fixed price tenders for providing and laying approximately 7,000 yd. of 3-in. dia., 5,500 yd. of 4-in. dia., and 2,700 yd. of 6-in. dia. asbestos-cement and cast-iron water mains, together with ancillary fittings in miscellaneous lengths in the parishes of Dalton, Parbold and Wrightington, for R.D.C. Documents from the surveyor, James Holding, 10, Bridgeman Terrace, Wigan. Deposit £3 3s., by cheque payable to Council.

SHEFFIELD, YORKS, June 4—Supply and erection at the Blackbrook Road sewage pumping station of the following, for City Council: Two centrifugal pumps of the vertical spindle type, each to deliver 150 gallons per min. of raw unscreened sewage against a total estimated head of 63 ft. The plant is to be complete with electric motor, control gear, valves, pipework, fittings and other necessary apparatus. Documents from the City Engineer, Town Hall, Sheffield, 1. Deposit £2 2s.

INDIA, May 19—Foundry and smithy shop equipment. May 21—Carpentry shop equipment. (ESB/10320/58.)

Latest Foundry Statistics

Aluminium Castings: The Ministry of Supply production figures for February recently released show that the output of aluminium sand-cast castings was 1,681 tons, that of gravity-die-castings 3,859 tons and of pressure-die-castings 1,382 tons.

Copper-based Castings: It is learnt from figures supplied by the British Bureau of Non-Ferrous Metal Statistics that output of copper-based castings during February was 6,575 tons. Production during January and February was 12,974 tons against 13,525 tons in the similar period in 1957.

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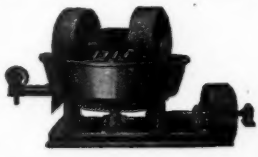

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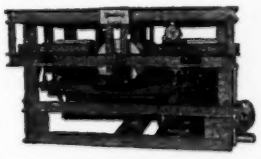

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Derbyshire.

Telephone:
Belper 12

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

May 14, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 10s. 0d. to £48 0s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £67 0s. 0d. to £67 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 8d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 1d. to 1½d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 2½d. to 7s. 9½d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £177 0s. 0d. to £177 10s. 0d.; three months, £179 5s. 0d. to £179 10s. 0d.; settlement, £177 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 8¾d. per lb.; rods, 204s. 3d. per cwt. basis; 20 s.w.g., 237s. 0d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £733 0s. 0d. to £733 10s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—First half May, £72 0s. 0d. to £72 5s. 0d.; first half August, £72 10s. 0d. to £72 12s. 6d.

Zinc.—First half May, £61 2s. 6d. to £61 5s. 0d.; first half August, £61 15s. 0d. to £61 17s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £96 7s. 6d.; rolled zinc (boiler plates), all English destinations, £94 2s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £85 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 5¾d. per lb.; sheets to 10 w.g., 155s. 6d. per cwt.; wire, 2s. 3½d.; rolled metal, 155s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £129; B6 (85/15), — ; BS240, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £169; HTB2 (38 tons), — ; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £155; LG3 (86/7/5/2), £165; G1 (88/10/2/½), £224; (88/10/2/1), £214.

Phosphor Bronze.—BS1400, PB1 (AID released), £240 per ton.

Phosphor Bronze Strip, etc.—Strip, 231s. 0d. per cwt.; wire, 3s. 6½d. per lb.; rods, 2s. 9½d.; tubes, 2s. 9¾d.; chill cast bars: solids 2s. 10½d.; cored 2s. 11½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 9¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 8¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £197 10s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, — ; AB2, £209.